

Extraction and Application of Natural Dye from the Petals of Red Rose (*Rosa Centifolia*) on Cotton Yarns

Thu Zar Thant*

Abstract

Red rose (*Rosa centifolia*) is one of the most important ornamental plants mainly growing in garden and rich in red and pink colors. In the present study, the dyeing pigments present in petals of red rose were extracted by using aqueous methods. The physical properties (pH, specific gravity, viscosity) of selected dye solution were determined by using respective equipments. The four different mordants were used to isolate dye on cotton yarns by together-mordanting method. The results revealed that different shades of pink and bluish colour were obtained from the dye when subjected to mordant. On dyed cotton, together-mordanting method gave the attractive and uniform color. The final results of rating of fastness properties of cotton yarns in four different mordants are found to be good.

Key words: Red rose (*Rosa centifolia*), pH, specific gravity, viscosity, mordants

Introduction

Dyes are the colouring materials that colour commodities of our day to day use. By definition dyes can be said to be coloured, ionizing and aromatic organic compounds which shows on affinity towards the substrate to which it is being applied. Dye is generally applied in a solution that is aqueous. Dyes may also require a mordant to better the fastness of the dye on the material on which it is applied. (Jothi, D., 2008)

Dyes may be divided into two groups, natural and synthetic dyes. Natural dyes are derived from naturally occurring sources such as plant (eg. indigo and saffron); insects (eg. cochineal beetles and lac scale insects); animals (eg. some species of mollusks or shellfish); and minerals (eg. ferrous sulfate, ochre and clay) without any chemical treatment. (Patil, D.B. K.N. Patil, P.V. Gaikwad, P.J. Patil, U.L. Shewale and S.B. Bhamburdekar, 2016)

Every herb can be used to make dye. The most common herbal parts used for extracting dyes are seeds, flowers, leaves, berries, stem, bark, roots. Natural dyes are now-a-days in demand not only in textile industry but in cosmetics, food, leather and pharmaceutical industry. Natural dyes are biodegradable eco-friendly. (Sachan, Kiran and VP Kapoor, 2007)

Aim and Objectives

Aim

The aim of this research work is to extract natural dye from the petals of red rose (*Rosa centifolia*) and dyeing in cotton using extracted natural dye with several natural mordant.

* Lecturer, Department of Chemistry, Yadanabon University

Objectives

- To collect the samples (Petals of Red Rose) from Pyin Oo Lwin Township, Mandalay Region
- To extract the natural dye from the samples
- To determine the physical properties of dye solution
- To dye cotton yarns with various mordants using together-mordanting method
- To determine the rubbing fastness and the washing fastness properties of dyed cotton yarns.

Botanical Description

Scientific name:	<i>Rosa centifolia</i>
Family:	Rosaceae
Myanmar name:	Hnin si ni
English name:	Red Rose
Part used:	Petals



Figure 1. Flowers of *Rosa centifolia*

Materials and Methods

Sample Collection and Treatment

Petals of Red Rose were collected from Pyin Oo Lwin Township, Mandalay Region. Fresh petals of Red Rose free from diseases were collected in clean and clear bags from Pyin Oo Lwin garden.

Extraction of Dye from Fresh Petals of Red Rose

Procedure

Fresh raw material (100 g) was soaked in distilled water (1400 ml) and kept overnight. The resulted coloured solution was subjected to warming at 90°C with continuous stirring for 1hr. The extracted solution was filtered by cotton cloth for 10 minutes to remove suspended impurities. The resulted solution (800 mL) was used as dye solution.

Dyeing of Cotton

Substrate

Cotton yarns were purchased from White Rose Natural Dye Cotton Shop, in Amarapura Township.

Chemicals

Laboratory grade chemicals: copper II sulphate, ferrous II sulphate, alum and myrobalan were used.

Equipment

Equipment used in the present study are weighing balance and water bath.

Scouring the Cotton Yarns

The raw cotton yarns were hit with washing stick for about 15–30 minutes, followed by washing with water. This cotton yarns were dried under sunshine and it was cut about 12 inches.

Preparation of Mordants Solution

The collected mordant was ground with motor and pestle. The mordant powders were dissolved with distilled water (1:50 w/v).

Copper II Sulphate Solution

Copper II sulphate 1.00 g was placed in a beaker. Into this beaker 50 ml of distilled water was added to dissolved copper II sulphate.

Ferrous II Sulphate Solution

Ferrous II sulphate 1.00 g was placed in a beaker. Into this beaker 50 ml of distilled water was added to dissolved ferrous II sulphate.

Alum

1.0 g of alum was placed in a beaker. Into this beaker 50 ml of distilled water was added to dissolved alum.

2.0 Myrobalan

1.00 g of myrobalan was placed in a beaker. Into this beaker 50 mL of distilled water was added to dissolved myrobalan.

Methods

Extraction of Dye from Petals

Extraction of colour dye was carried out by aqueous methods.

Aqueous Extraction Method

10 g of fresh petals of red rose were boiled in 100 mL distilled water at 100°C for 30 minutes. The decolorized petals were taken out from extraction solvent.

Scouring of Cotton Yarns

Cotton yarns used for dyeing were boiled in 10 % NaOH solution for 10 min to remove starch and other impurities from the cloth. The NaOH treated cotton cloths were then thoroughly washed with cold distilled water.

Dyeing and Mordanting

The clean scouring cotton yarns were treated with different Mordant such as copper II sulphate (CuSO_4), ferrous II sulphate (FeSO_4), alum and myrobalan.

Dyeing with Mordants

Most of the natural dyes have colour instability. Therefore, mordants are needed to set the colour when using natural dyes. The four different mordants of dyeing employed were together mordanting. The 1 % concentration of each mordant (copper II sulfate, ferrous II sulfate, alum and myrobalan) was used.

Together-mordanting

The cotton yarns were immersed in 50 mL of 1 % mordant and dye solution at 80–90°C for 45 minutes. After cooling and filtering, the dyed cotton was dried in air (1:1 v/v).

Physical Investigation on Effective Dye Solution

Determination of Specific Gravity

The specific gravity bottle was washed thoroughly with distilled water, dried and weighed. Then, the bottle was filled with the sample (dye solution) at room temperature. The excess solution from the capillary was wiped with the piece of tissue paper and weighed. The above procedure was carried out by using distilled water.

Determination of Viscosity

To determine the viscosity of the dye solution, U-tube viscometer was used. It was cleaned by using distilled water and then dried. The viscometer was filled with dye solution through a tube using a long pipette to minimize any wetting of the tube above the filling mark A. The viscometer was allowed to stand for 20 minutes to reach the test temperature (27°C) and the volume was adjusted using the liquid. After the sample has reached the test temperature, suction was applied to bring the liquid level up to a point 1 cm above the timing mark B. The suction was released and the time required for the bottom of the meniscus to pass from the top edge of mark B to the top edge of mark C was measured. The above procedure was carried out by using distilled water.

Determination of pH

Petals of Red Rose dye solution (20 mL) were placed into a beaker. The pH of dye sample solution was measured by means of pH meter.

Results and Discussion

Physical Investigation of Effective Dye Solution

Physical properties such as pH, specific gravity, and viscosity were determined. The results are shown in Table (1).

Table 1. Physical Properties of Effective Dye Solution

No.	Characteristics	Composition
1.	pH	5.5
2.	Specific gravity	0.9381
3.	Viscosity	2.015 cP

According to Table (1), the pH of the dye solution was found to be 5.5. Specific gravity was found to be 0.9381 and viscosity was found to be 2.015 cP.

All the determination was repeated three times and the mean value was described.

Figure-2 Dyeing Process of Cotton Yarn (four different mordant) by Together-Mordanting



To determine the effectiveness of dye sample solution on dyeing of cotton yarns, four different mordants (copper II sulphate, ferrous II sulphate, alum and myrobalan) were used. Four yarns of NaOH treated cotton yarns were dyed in each of the 1% mordant solution add together-mordanting method. It can be seen that the colour of cotton yarns were different by using the four different mordants of dye solutions. The observed different colours are shown in figure-2.

Rating of Fastness Properties of Cotton Yarns

The different colour shades were obtained from various mordants of petals of red rose. The extracts shows variation in colour and which mainly depends upon the various mordants. The Rating of fastness properties of dye and mordant are given in the Table (2).

Table 2. Rating of Fastness Properties of Cotton Yarns

Sr. No.	Mordants	Cotton yarns
1	Copper II Sulphate	Good
2	Ferrous II Sulphate	Good
3	Alum	Good
4	Myrobalan	Good

The three different methods of dyeing employed were pre-mordantation, together-mordantation and post-mordantation. In the pre-mordanting method, the substrate is treated with the mordant and then dyed. In the together-mordanting, the mordant is added in the dye both themselves. In the post-mordanting, the dyed material is treated with a mordant. In the three mordanting methods, together-mordanting method gave the bright and uniform attractive colour more than two other methods. A mordant is a substance used to set dyes on fabrics or tissue sections by forming a coordination complex with the dye which then attaches to the fabric or tissue. It may be used for dyeing fabrics, or for intensifying stains in cell or tissue preparations. According to table (2), four different mordants copper II sulphate, ferrous II sulphate, alum and myrobalan are good results in together-mordanting method for dyeing process.

Conclusion

Thus, results obtained from the present investigation revealed that, the petals of red rose flower have the dyeing potential as a source for cotton dyeing. Dyes obtained from the petals of red rose can be used as cost effective and economically commercial for various industries such as textile, cosmetic, leather, food and pharmaceuticals. Of the three mordanting methods, together-mordanting method gave the attractive colour than two other methods. This study revealed that the petals of red rose could be used as a dye for dyeing cotton yarn and the dye does not make any problems to the environment.

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References

- Fessenden, R.J. and J. S. Fessenden, (1990), "*Organic Chemistry*," Cole Publishing Company, California
- Harbone, J.B., (1984), "*Phytochemical Methods: A Guide to Modern Technique of Plant Analysis*," 2nd ed., Chapman and Hall Ltd., U.S.A
- Jothi, D., (2008) "Extraction of natural dyes from African marigold flower (*Tagetes erecta* L) for textile coloration", *Autex Research Journal*, 8 (2), 49-53,
- Patil, D.B. K.N. Patil, P.V. Gaikwad, P.J. Patil, U.L. Shewale and S.B. Bhamburdekar, (2016) "Extraction of natural dyes from rose flower for dyeing cotton fabrics", *International Journal for Innovative Research in Multidisciplinary Field*, ISSN – 2455-0620, Vol. 2, Issue-8
- Sachan, Kiran and VP Kapoor, (2007), "*Optimization of Extraction and Dyeing Condition for Traditional Tumeric Dye*"

Online Materials

https://en.m.wikipedia.org/wiki/Natural_dye retrieved on 27 March 2019

<http://www.sciencedirect.com/synthetic-dye> retrieved on 27 March 2019

