

NEHRU SMARAKA VIDYALAYA



PROJECT REPORT

SUBJECT: Chemistry

TOPIC: Dyeing of Fabrics

EXPERIMENT: To dye wool and cotton clothes with malachite green.

SUBMITTED BY:

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Class XII

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Certificate

This is to certify that Spoorthi Kulkarni studying in class XII has successfully completed the project titled Dyeing of fabrics in the laboratory of Chemistry of this institution as prescribed by the Central Board of Secondary Education for AISSCE for the year 2017-18.

TEACHER IN-CHARGE

HOD

PRINCIPAL

SIGN WITH SEAL

EXTERNAL EXAMINER

DATE:

Acknowledgement

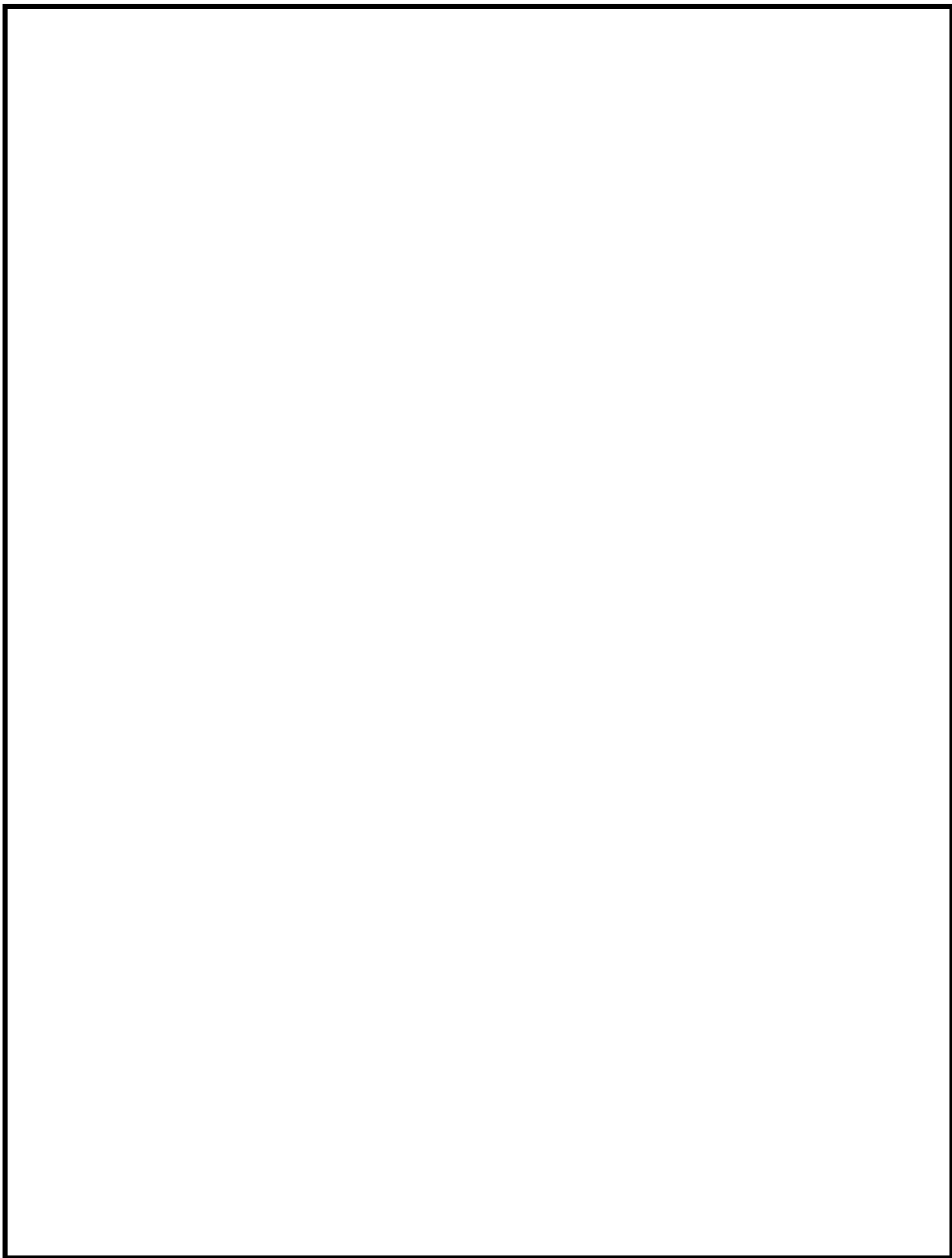
In the completion of this project successfully many people have bestowed upon me their blessings and heart pledged support, this time I am utilizing to thank all the people who have been considered with this project.

I would like to thank my principal Mr. Arokia Raj sir and my chemistry teacher Mr. Pradeep DB sir whose valuable guidance has been the ones that helped me complete this project and make it a success, his suggestions and his instructions served as a major contribution towards the completion of this project.

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Introduction

Dyeing *is the process of adding color to textile products like fibers, yarns, and fabrics.*

Dyeing is normally done in a special solution containing dyes and particular chemical material. After dyeing, dye molecules have uncut chemical bond with fiber molecules.

The *temperature* and *time controlling* are two key factors in dyeing.

There are mainly two classes of dye:

- Natural
- Man-made

The primary source of dye, historically, has generally been nature, with the dyes being extracted from animals or plants.

Since the mid-19th century, however, humans have produced artificial dyes to achieve a broader range of colors and to render the dyes more stable to resist washing and general use.

Different classes of dyes are used for different types of fiber and at different stages of the textile production process, from loose fibers through yarn and cloth to complete garments.

Acrylic fibers are dyed with basic dyes.

Nylon and Protein fibers such as *Wool and Silk* are dyed with acid dyes

Polyester yarn is dyed with disperse dyes.

Cotton is dyed with a range of dye types, including vat dyes, and modern synthetic reactive and direct dyes.



Dyeing of Cotton



Dyeing of Acrylic Fibres



Dyeing of Polyester Yarn



Dyeing of Silk Fibres

Types of Dyes (Major types) :

✓ Acid dyes:

These are azo dyes and are characterized by the presence of acidic groups.

✓ Basic dyes:

These dyes contain organic basic groups such as NH_2 or NR_2 .

✓ Direct dyes:

These are also azo dyes and are used to dye the fabrics directly by placing in aqueous solution of the dye.

✓ Disperse dyes:

These dyes are applied in the form of a dispersion of minute particles of the dye in soap solution in the presence of phenol or benzoic acid.

✓ Vat dyes:

These dyes are water-insoluble and before dyeing these are reduced to colourless compounds in wooden vats by alkaline reducing agents.

EXPERIMENT

◆ Aim:

To dye wool and cotton clothes with malachite green.

◆ Requirements:

500 ml beakers, tripod stand, wire gauze, glass rod, spatula, wool cloth and cotton cloth.

Sodium carbonate, tannic acid, tartaremetic acid and malachite green dye.



500 ml beaker



Tripod stand



Wire gauze



Glass rod



Sodium



Tannic Acid



Tartaremetic



Malachite

◆ Theory:

Cotton fibres show good durability and utility. It is a stable material; it stays undamaged even in the conditions of high exposure of weak acids and alkalis.

It has high water absorbing capacity. Cotton fabrics are easy to dye, they have very low elasticity characters. They are easy washable and can be ironed even at very high temperatures.

Woolen fibres are high moisture absorbers too.

They take up moisture in vapour form.

It generates heat when it absorbs moisture.

Each wool fibre is a molecular coil-spring, making the fibre remarkably elastic.

They have highly durability and resilience.

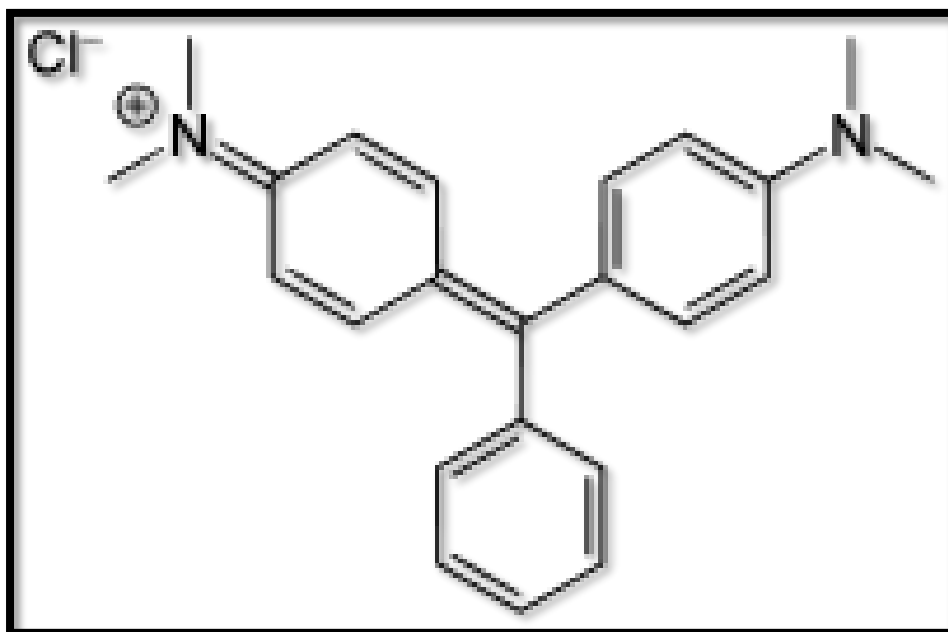
Nature has folded the chemical polypeptide chains back upon themselves in such a way that they act like a coiled spring which elongates when it is extended and retracts when it is released.

Malachite Green is an organic compound that is used as a dyestuff and controversially as an antimicrobial in aquaculture. Malachite green is traditionally used as a dye for materials such as silk, leather, and paper. Although called malachite green, this dye is not prepared from the mineral malachite - the name just comes from the similarity of colour.

Chemical formula: $[\text{C}_6\text{H}_5\text{C}(\text{C}_6\text{H}_4\text{N}(\text{CH}_3)_2)_2]\text{Cl}$

Common Name: Triarylmethane dye.

Structure:



◆ Procedure:

- * Preparation of sodium carbonate solution:
Take about 0.5g of solid sodium carbonate and dissolve it in 250ml of water.
- * Preparation of tartaremetic solution:
Take about 0.2g of tartaremetic and dissolve it in 100ml of water by stirring with the help of glass rod.
- * Preparation of tannic acid solution:
Take 100ml of water in a beaker and add about 1.0g of tannic acid to it. Heat the solution. On heating a clear solution of tannic acid is obtained.
- * Preparation of dye solution:
Take about 0.1g of malachite green dye and add to it 400ml of water. Warming results in a clear solution of the dye.
- * Dyeing of wool:
Take about 200ml of dye solution and dip in it the woolen cloth to be dyed. Boil the solution for about 2 minutes. After that remove the cloth and wash it with hot water 3-4 times, squeeze and keep it for dyeing.

** Dyeing of cotton:*

Cotton does not absorb malachite green readily, therefore it requires the use of a mordant. For dyeing a cotton cloth dip it in sodium carbonate solution for 10 minutes and then rinse with water. Then put the cloth in hot tannic solution for about 5 minutes. Now take out the cloth from tannic acid solution and keep it in tartaremetic solution for about 5 minutes. Remove the cloth and squeeze it with spatula to remove most of the solution. Now place the cloth in boiling solution of the dye for about 5 minutes. Remove and wash the dyed cloth thoroughly with water, squeeze and keep it for drying.

** Dyeing of cotton directly:*

Take another piece of cotton cloth and put it directly into boiling solution of the dye. Keep it dipped for about 2 minutes. Remove the cloth, wash it with water, squeeze and keep it for drying.



Cotton white cloth



Woolen white cloth



Malachite Green
Solution



Boiling of Malachite Green
Solution



Cotton cloth in Malachite
Green Solution



Woolen cloth in Malachite
Green Solution



Dyed Cotton cloth



Dyed Woolen cloth

◆ Observations:

- *The colour of wool cloth directly by dipping in hot solution of malachite green dye is fast.*
- *The colour of cotton cloth dyed directly (without using mordant) by dipping in hot solution of malachite green is not fast to washing and is of low intensity.*
- *The colour of cotton cloth dyed indirectly by using mordant and then by dipping in hot solution of malachite green is fast to washing and is of high intensity.*

◆ Precautions:

- ♣ *Let the Malachite Green solution boil properly for about 8-10 minutes to get better results.*
- ♣ *While dyeing cotton directly, let the cotton cloth be present in the dye for more than or equal to 2 minutes but not less.*
- ♣ *Using of solutions such as tartaremetic solution, tannic acid solution must be eminent.*
- ♣ *Usage of gloves is preferable to ensure tidiness.*

Conclusion

<i>DYE</i>	<i>FABRIC</i>	<i>RESULT</i>
<i>Malachite green</i>	<i>Wool</i>	<i>Fast</i>
<i>Malachite green</i>	<i>Cotton</i>	<i>Not fast to washing. Low intensity.</i>
<i>Sodium Carbonate soln.+ Tartaremetic soln.+ Tannic acid soln.+ Malachite green</i>	<i>Cotton</i>	<i>Fast to washing. High intensity.</i>

The above table clearly shows the variation in results by using various mordant dyes (indirect dyeing) or by using only malachite green (direct dyeing).

*This gives the conclusion to the experiment-
“Dyeing of wool and cotton cloths with malachite green.”*

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