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Comparative Study of Mordants in Pre-Treatment for Eco-Printed Fabrics via Hammering

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ABSTRACT

Printing is the process of applying colour to fabric in the shape of a particular pattern or design. Eco-printing is an environmentally friendly method of printing textiles that uses steaming or hammering to transfer plant pigments to fabric. This method produces unique, nature-inspired prints using organic materials like flowers and leaves. In the fabric printing process, eco-printing is essential for advancing environmental sustainability. Many industrial processes nowadays have a substantial negative impact on the environment, and one of the biggest polluters is the textile industry. By doing away with the need for dangerous chemicals and artificial dyes, eco-printing becomes a viable substitute. The method has been applied for a variety of purposes all over the world, in many cultures and eras. It creates fresh and original print designs using only natural ingredients. Customers looking for natural aesthetics are drawn to the resulting patterns, which are frequently unique and have aesthetically pleasing, organic shapes and colours. Eco-printing, in contrast to traditional techniques, does not strive for precise reproducibility, which enhances each piece's individuality and allure. The goal of this study is to identify the best types of mordent for fabric printing by focussing on their use in eco-printing. As eco-printing gains popularity as a sustainable method of printing textiles, this study also examines how floral can be increase value and reduce environmental impact. Using botanical printing, The investigation aims to promote an environmentally conscious approach to textile art while producing stunning, sustainable designs through botanical printing with the use of mordent to enhance the printing.

Keywords: Eco-Printing, Hammering, Mordents, Environmental Impact, Sustainability

INTRODUCTION

Textile surface decoration has given garments variety, life, and interest. The practise of printing has made a great contribution to both the aesthetic appeal of the planet and the aesthetic appeal of textiles. The term "textile printing" refers to the process of painting or printing patterns onto fabric. To get the desired results, printing also needs a variety of highly specialised tools, materials, skills, and aesthetic sense. India has used natural printing techniques for thousands of years; it is an integral element of the country's culture. Natural dyes come from natural materials, as the name implies. Until to the middle of the 19th century natural dyes were the principal colourants available for textile dyeing and printing operations. Due to the demands of rapid fashion, low cost, easy, and reproducible printing processes, the use of natural procedures and natural dyes for printing has been drastically reduced since the introduction of synthetic dyes (Waghmode *et al.*, 2018).

Flowers are an important part of worship in many countries. Yet their disposal is posing to be a phenomenal ecological hazard (Azad, 2019). Even though flowers and plants biodegrade, it usually takes several months for them to break down into compost (Wijayapala, 2014). Such flower waste creates land and water pollution, invertebrate influx, and foul odor (Whelan, 2009). Floral wastes, however, have a tremendous, and largely unexploited potential of being converted into dyes and prints by using simple and inexpensive technologies (Azad,

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2019). In recent years eco-printing (Flint, 2008) and plant pounding have gained popularity as sustainable methods to color and print textiles (WGSN, 2020). Pounding plants is the transfer of plant pigment onto textiles through the mechanical force of hammering, where the resulting image can mimic the original petal or leaf. Even though plant pounding is a popular technique that has been studied for its colorfastness (Haar and Doty, 2017), research shows many artists and natural dyers use this technique mainly for home goods and as a DIY craft (Martin, 2001).

Applying colour to fabric in the form of a specific pattern or design is known as printing. Plant pigment is transferred to textiles using the mechanical force of hammering in the eco-printing technique. In order to ensure environmental sustainability, eco printing is crucial in the fabric printing process. There are several elements today that are hurting the environment and contributing to pollution. The textile sector is one of the biggest causes of environmental pollution. This method has been applied on many products for various applications in various parts of the world at various times. New print designs are produced via eco-printing using only natural ingredients. These printed patterns are distinctive and catch customers' attention since they look and feel natural. The method is not strictly concerned with reproducing the outcomes. Several plants that aren't thought of as typical dye plants generate vibrant prints, and classic dye plants occasionally do too when used to make eco prints. Its print's colours and shapes are both well-defined and nicely dispersed on the cotton cloth. An enormous amount of flowers are thrown away each year after being used just once at places of worship and on special occasions throughout the world. Eco-printing is becoming more and more well-liked as a sustainable way to dye and print textiles

On the basis of sustainability, green chemistry, and ecological methods, there is currently significant interest in the revival of natural printing and natural products . Natural dyes are valuable for printing on textiles and have historical, cultural, and economic significance. Natural printing techniques are regarded as eco-friendly since they are regenerative and biodegradable, kind to the skin, and may even improve the wearer's health (Flint, 2008). To adhere the print to the textile fibres, many natural printing dyes require the addition of compounds referred to as mordants. Mordants combine with natural printing dyes and fibres to create a stable molecular coordination complex. Alum was formerly the most popular mordant (aluminium sulphate - a metal salt of aluminium). Eco-printing is one of the natural printing processes that doesn't utilise any synthetic chemicals or colours. There has been a lot of research done recently on the use of bio waste and agricultural waste in natural dyeing.

METHODOLOGY

- Research on Hammering printing technique with Rose and Marigold combination, Marigold, and Rose.
- Flower Impression Print (Pounding) on cotton fabric by using flowers.
- Effect of pre mordanting was done on the cotton sample.

Mordanting processes:

Aluminium Potassium Sulphate, Ferrous Sulphate, and Copper Sulphate is the mordent used on fabric in this process. Five percentage of three mordent - Aluminium Potassium Sulphate, Ferrous Sulphate, and Copper Sulphate used. Mix the solution until dissolves. Add one part of the fabric into the mordent solution. After 60 minutes take the fabric from the solution. Gently squeeze the fabric and remove the moisture content in it. Dry the fabric in shade.

Flower Impression Print:

The mordent treated fabric is dried in the shade flowers the fabric is placed on top of the thick sheet. Then the fabric is separated into two parts. One part of the fabric is printed with a flowers.

RESULTS AND DISCUSSION

The printing performance of three mordants—Aluminium Potassium Sulphate, Ferrous Sulphate, and Copper Sulphate—was evaluated on three flower sources (Rose and Marigold combination, Marigold, and Rose) at concentrations of 5%, 10%, 15%, 20%, and 25%. The assessment parameters included sharpness of outline, evenness of print, depth of shade, and aesthetic appeal. The overall performance was expressed as an average score across these four parameters (Table 1 and 2).

Aluminium Potassium Sulphate:

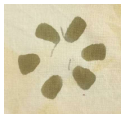
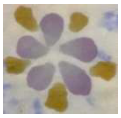
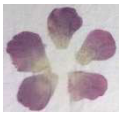
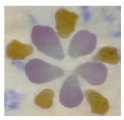
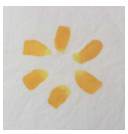
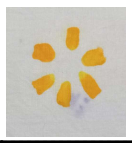
The highest average score (4.00) was recorded for

Rose and Marigold at 25%, closely followed by Rose at 10% (avg. 4.19 for sharpness and aesthetic appeal but slightly lower in depth). The trend indicated that higher mordant concentrations improved outline sharpness and aesthetic appeal, though the depth of shade plateaued beyond 20%.The evenness of print improved steadily with

Table 1 : Effect of Different Mordants and Concentrations on Printing Quality Parameters

Aluminium Potassium Sulphate															
Flower	Rose and Marigold Flower					Marigold Flower					Rose				
Percentage	5%	10%	15%	20%	25%	5%	10%	15%	20%	25%	5%	10%	15%	20%	25%
Sharpness of Outline	3.19	3.88	3.38	3.44	4.19	2.69	3.56	3.25	3.81	4.44	4.31	3.94	4.44	3.38	3.38
Evenness of Print	3.13	3.5	3.19	3.31	3.88	2.69	3.50	3.44	4	4.44	4.38	4.13	4.31	3.25	3.06
Depth of Shade	3.06	3.63	3.19	3.13	3.88	2.50	3.13	3.19	3.69	4.31	3.69	4.25	4.13	4.38	3.06
Aesthetic Appeal	3.06	3.75	3.31	3.31	4.06	2.63	3.06	3.38	3.38	4.31	3.63	4.5	4.56	4.5	3.25
Ferrous Sulphate															
Flower	Rose and Marigold Flower					Marigold Flower					Rose				
Percentage	5%	10%	15%	20%	25%	5%	10%	15%	20%	25%	5%	10%	15%	20%	25%
Sharpness of Outline	2.8	3.1	3.6	3.8	4.3	3.10	3.7	3.80	3	3.9	2.75	3.1	3.6	3.6	4.4
Evenness of Print	2.6	3.1	3.2	3.4	4	3	2.69	3.6	3.75	4.4	2.75	3	3.6	3.8	4
Depth of Shade	2.7	3.1	3.6	3.7	4.3	2.5	3.1	3.1	3.4	3.6	2.5	3.3	3.1	3.6	4.3
Aesthetic Appeal	2.7	3.4	3.3	3.6	4.1	3.3	3.5	3.9	3.9	3	2.6	3.8	3.8	3.6	4.3
Copper Sulphate															
Flower	Rose and Marigold Flower					Marigold Flower					Rose				
Percentage	5%	10%	15%	20%	25%	5%	10%	15%	20%	25%	5%	10%	15%	20%	25%
Sharpness of Outline	2.6	3.3	3.6	3.6	4.4	3.6	3.6	3.25	4.3	4.4	2.8	3.1	3.6	3.8	4.3
Evenness of Print	3.1	3.2	3.3	3.4	3.9	2.8	3.6	3.7	3.9	4.3	2.3	2.5	2.9	3.3	4.4
Depth of Shade	3.7	4.3	4.2	4.4	4.4	4.1	4.3	4.1	4.3	4.3	2.7	3.7	3.4	3.3	4.2
Aesthetic Appeal	3.2	3.3	3.4	3.8	4.5	3.4	3.5	3.9	3.9	4.3	3.3	3.6	4.5	4.5	4.5

Table 2 : Effect of Different Mordent and Concentration on Printing Quality Parameters

Percentage of Mordent	Aluminium Potassium Sulphate			Ferrous Sulphate			Copper Sulphate		
	Rose	Marigold Flower	Rose and Marigold Flower	Rose	Marigold Flower	Rose and Marigold Flower	Rose	Marigold Flower	Rose and Marigold Flower
5									
10									
15									
20									
25									

concentration, with the 25% level producing crisp outlines and balanced tone distribution.

Ferrous Sulphate:

The best result (avg. 4.25) was observed for Rose at 25%, showing the highest sharpness (4.4) and strong depth (4.3).Marigold at 20% and 25% also performed well (avg. >4.0), indicating Ferrous Sulphate's effectiveness in enhancing depth of shade, particularly for yellow-toned prints. However, at lower concentrations (5–10%), the evenness and aesthetic appeal were comparatively lower, producing duller tones.

Copper Sulphate:

Copper Sulphate produced the highest overall score among all mordants, with Rose at 25% achieving an average of 4.35, followed closely by Marigold at 25% (4.33) and Rose and Marigold at 25% (4.30). Unlike the other mordants, Copper Sulphate showed consistently high depth of shade values from 10% onward, indicating its strong fixation capacity for both warm and cool tones. The sharpness of outline and evenness of print were markedly improved at 20–25% concentration, producing vibrant, well-defined prints.

Conclusion:

It shown the results that higher mordant content improves pigment binding and definition without significant loss of tone quality.

For maximum vibrancy and clarity:

Copper Sulphate (25%) was optimal, particularly with rose prints.

For enhanced depth and antique tones:

Ferrous Sulphate (25%) worked well, especially with darker florals.

For balanced sharpness and elegance:

Aluminium Potassium Sulphate (25%) was effective, particularly with combination flower prints.

However, due to its hazardous effects and universal ban, Copper Sulphate should be used at a maximum concentration of only 1%. Considering this restriction, Aluminium Potassium Sulphate emerged as the most effective mordant after Copper Sulphate. Similar findings were reported by Swetha Dharshini and Nagaveni (2023), who noted that pre-mordanting enhances printing quality, improving color depth and outline definition in natural dye applications.

REFERENCES

Azad, Y. (2019, April 22). A hidden treasure in tones of floral trash. *First Post.* https://www.firstpost.com/world/a-hidden-treasure-in-tonnes-of-floral-trash- 6494121.html

Flint, I. (2008). *Eco color: botanical dyes for beautiful textiles*. Murdoch Books UK Limited.

Haar, S. and Doty, K. (2017). Pounded plants on cotton: Methods, outcomes, and colorfastness of post-treatments. *10th International Shibori Symposium Official Proceedings 2016*, 59-66. https://10thiss.files.wordpress.com/2016/03/10iss-press-kit_proceedings.pdf

Martin, L.C. (2001). *The art and craft of pounding flowers*. QVC Publishing, Inc.

Swetha Dharshini, R. and Nagaveni K. (2023). Comparative Study on Printing of Rose and Linen Fabric Using Marigold and Banana Flower as Flower Impression Print. *International J. Creative Res. & Thought*, Volume **11**, Issue 5 May 2023 | ISSN: 2320-2882

Waghmode, M.S., Gunjal, A.B., Nawani, N.N. and Patil, N.N. (2018). Management of floral waste by conversion to value-added products and their other applications. *Waste & Biomass Valorization*, **9**(1) : 33-43. doi:101007/s12649-016-9763-2

WGSN (2020). Sustainability and innovation: Naturally derived colour. https://www.wgsn.com/content/board_viewer/#/86346/page/8

Whelan, C. (2009). Blooms away: The real price of flowers. *Scientific American*. https://www.scientificamerican.com/article/environmental-price-of-flowers/

Wijayapala, S. (2014). Utilization of sepalika (nyctanthesarbor-tristis) flowers, a temple waste as a source for a potential coloring agent for textile substrates used in the textile industry. *Proceedings of International Forestry and Environment Symposium*. 18. 10.31357/fesympo.v18i0.1917.

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