

Development of a Sustainable and Skin-Friendly Marigold Flower-Inspired Resort Wear Collection Using Natural Dyeing Techniques

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Abstract— Clothing, often referred to as our second skin, holds immense significance in human existence, undergoing continuous evolution throughout history. Herbal textiles are shown special properties in clothing that is used for a variety of purposes. This research investigates the potential of design and develop a resort wear collection for Sri Lankan ladies in age group 22-26, inspired with Marigold flower for spring and summer 2023/24. Natural dye of the Marigold flower has vibrant hue and medicinal properties was used as a value addition for fabric surface preparation and it benefits for cure skin allergies. Natural herbal fabric dyes are gaining popularity due to their eco-friendly and skin-friendly properties.

More than the use of Marigold flower for concepts and design developments, this study examines the properties of Marigold flowers and their potential medicinal benefits for skin health. Due to its abundance of antibacterial agents, anti-inflammatory chemicals, and antioxidants, Marigold is a good choice for people with sensitive skin types and allergies. Designed and developed resort wear collection with free size silhouettes, highlighted with unique features of Marigold flower and offer comfort and skin care for the wearer encouraging taking part in leisure activities at resorts. Combining the benefits of natural herbal fabric dye with free-size resort wear collections presents a holistic approach to sustainable and skin-friendly fashion. This design approach not only captures the essence of nature-inspired elegance but also paves the way for potential technological innovations that promote sustainability in contemporary fashion and clothing practices.

Keywords: Marigold flower, Natural dye, Sustainable clothing, Resort wear collection

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I. INTRODUCTION

The fashion industry is shifting towards sustainability and skin-friendly practices, with natural herbal dyes emerging as a competitive alternative. This shift is particularly significant in resort wear collections, offering a luxurious experience. Natural herbal fabric dyes, derived from plant materials are safe and non-toxic alternatives to synthetic dyes, making them ideal for sensitive skin and those with allergies, offering a gentle and non-toxic alternative to harsh chemicals.

The flower “Marigold” is known for its bright colour and healing properties, is a valuable plant-based dye with anti-inflammatory, antioxidant, and antibacterial properties. It's rich in flavonoids, carotenoids, and essential oils, making it beneficial for sensitive skin and supporting overall health and skin regeneration. Marigold flower has long been recognized as a medicinal flower to address cuts, soars and general skin care, because it contains essential oils and a high concentration of flavonoids that shows potential applications in medicinal chemistry such as carotene. They function as anti-inflammatories, promoting topical healing and soothing inflamed skin. Topical use of a diluted Marigold solution or tincture hastens wound and rash healing. Marigold flower dyes fabric also gives hygiene appeal to the wearer that is highly needed for all human beings. Close touch with herbal clothes next to the skin increases body metabolism, resulting in effective removal of bodily toxins. After the herbs are absorbed via the skin, the herb-infused and herb-dyed organic textiles work as therapeutic agents. (Mishra, 2020).

This research focused to designed & developed a resort wear collection for Sri Lankan ladies in age group 22-26, inspired by Marigold flower for spring & summer 2023/24. Natural herbal dye of the Marigold flower used as a value addition for fabric surface treatment for medical purposes in aesthetical manner. Marigold creates yellowish red shades on cotton fabric which can be highly appealing and the colour strength was found to increase dyeing temperature and dyeing time. The dyed cotton fabric samples showed satisfactory colour fastness properties though testing. Cotton fabric was selected as the main fabric material for the collection considering the possibility to do natural dyeing (Sharma, 2018). This fashion collection focus to develop a free-size collections promote diversity and adaptability, enhancing resort wear vibes by accommodating various body types and sizes, reducing waste, improving comfort, and supporting sustainable fashion ecology. Marigold flower, a natural herbal fabric dye, addresses eco-friendly and skin-friendly fashion needs by incorporating it into resort wear collections and

incorporating free-size patterns for fashionable and functional clothing.

I. LITERATURE REVIEW

A. Natural Herbal dyes

Natural dyes have been used since prehistoric times for coloring the body, food, cave walls, fabrics, leather, and various everyday goods. Over the centuries, people have extracted dyes and pigments from a wide range of plants, animals, insects, and minerals. Archaeological discoveries of dyed textiles from ancient sites around the world provide evidence of the deep historical roots of dyeing practices, making it an art form that predates recorded history (Křížová, 2015).

Many artisans who practice natural dyeing believe that these dyes offer a richer, more aesthetically pleasing quality compared to synthetic alternatives. While some in the commercial sector argue that natural dyes may be less sustainable in terms of quality and cost, their unique visual appeal—combined with the ethical value of being environmentally friendly—makes them significant both as a craft and as an industry. Rising global environmental concerns have sparked renewed interest in using natural dyes, particularly on natural fibers (Tripathi, 2015).

Scientific evidence shows that some synthetic dyes can cause allergic reactions and toxic effects. In contrast, natural dyes are generally non-toxic, non-allergenic, and in some cases offer medicinal benefits for the skin. Unlike synthetic dyes, which often rely on non-renewable raw materials, natural dyes are typically renewable—being plant-based or agro-based—and biodegradable. They are also valuable for preserving ancient dyeing techniques, restoring archaeological textile finds, and conserving cultural heritage (Křížová, 2015).

A specialized branch of this tradition is herbal textiles—fabrics dyed exclusively with herbal extracts without the use of chemicals. These herbs differ from standard vegetable dyes because they also possess medicinal properties. The dyeing process uses only natural ingredients to retain these therapeutic qualities, and bleaching, when needed, is done naturally by sun exposure rather than chemical agents (Mishra, 2020).

The skin, while acting as a protective barrier, can also absorb herbal compounds from dyed fabrics. When worn next to the skin, herbal textiles can release beneficial properties into the body, enhancing the skin's ability to resist harmful substances and aiding in the removal of toxins. Skin temperature and sweat pores facilitate this absorption, making close contact between fabric and skin essential for therapeutic benefits (Mishra, 2020).

Common herbal dyes include turmeric, neem, aloe vera, onion, beetroot, and pomegranate. The entire process is conducted without chemicals, and herbs are applied directly to the cloth using natural materials to

preserve their medicinal value. Since synthetic dyes can generate large amounts of waste and unfixed colorants can harm both health and the environment, herbal dyes present an eco-friendly and health-conscious alternative (Kumar, 2021).

Herbal textiles not only avoid harmful chemicals but also prevent environmental pollution, particularly water contamination near processing sites. They can produce a range of colors such as red, yellow, brown, orange, and green using plant-based sources. This makes them a sustainable, healthy, and aesthetically diverse choice for modern textile production.

B. Resort wear and natural dyes market research

The global natural dyes market is projected to reach approximately USD 5 billion by 2024, with a compound annual growth rate (CAGR) of about 11% from 2018 to 2024. This growth is fueled by increasing emphasis on product quality and performance, along with stringent environmental regulations that encourage the use of natural ingredients. Rising consumer demand for natural, organic, and sustainable products has further accelerated the market's expansion.

Natural dyes are classified into three categories: animal-based, mineral-based, and plant-based. Among these, plant-based dyes accounted for over two-thirds of the global market share in 2018 and are expected to grow at a CAGR of around 12% during the forecast period.

C. Key Brands and Initiatives in Natural Dyeing:

- **Aagghhoo** (Bengaluru, India): Specializes in natural clothing, supplies, and toys for babies and toddlers. Guided by the philosophy of “design with empathy,” Aagghhoo focuses on meeting children’s emotional, sensory, and comfort needs through sustainable materials and processes.
- **Aranya** (Dhaka, Bangladesh): Established in 1990 to revive natural dyeing traditions, Aranya has grown into a network of more than 3,000 artisans nationwide. As a fair-trade social enterprise, it works to improve the livelihoods of marginalized producers by paying fair wages, ensuring market access, and promoting eco-friendly dyeing methods.
- **Ariya** (Boralesgamuwa, Sri Lanka): Produces naturally dyed clothing that is healthier for the skin and environmentally responsible. Offering an alternative to synthetic dyes—which are linked to environmental and health risks—Ariya creates garments using turmeric, red cabbage, hibiscus, avocado pits, tea, and other botanical materials, while supporting local artisan livelihoods.
- **COUTH** (Colombo, Sri Lanka): A casual wear brand emphasizing conscious design, timeless simplicity, and versatility. Their garments are crafted from handwoven natural fiber textiles, dyed with locally sourced materials, and accented with handcrafted beerulu lace from Galle.

COUTH fosters long-term partnerships with Sri Lankan artisans and actively celebrates their craftsmanship.

D. *Herbel value of the marigold flower*

Marigold flowers are widely distributed across the world, known for their rapid and consistent growth, and are easy to cultivate in home gardens. Originally native to Egypt, marigolds were introduced to Britain and other countries by the Romans. They are among the earliest cultivated flowers, with historical records showing that the ancient Greeks used their petals for decorative purposes, cosmetics, textile dyeing, food coloring and medicinal remedies.

Marigolds possess notable therapeutic properties, making them valuable in treating headaches, swelling, toothaches, wounds, and various skin conditions. They are effective in addressing contusions, bruises, varicose veins, minor skin injuries, and irritation. Marigold ointment aids in healing wounds caused by eczema and sunburn, while marigold tea can relieve cramps, improve digestion, ease nausea, treat stomach ulcers, and reduce menstrual discomfort. Its tincture is known to alleviate headaches, promote relaxation, and improve sleep. Additionally, marigold tea, with its anti-inflammatory and soothing properties, can be used in cold compresses and baths.

For centuries, marigold has been applied to burns, wounds, and rashes, providing relief from inflammation, redness, dryness, and swelling. Marigold extract is also used to treat skin discoloration, varicose veins, dermatitis, eczema, bruising, dandruff, insect bites, burns, infected wounds, and other symptoms linked to poor blood circulation and skin inflammation (Harlapur, 2020). Its medicinal power comes from essential oils and a high concentration of flavonoids, such as carotene, which act as anti-inflammatories, promote topical healing, and soothe irritation. Diluted marigold solutions or tinctures can accelerate the healing of wounds and rashes (Camellia's Tea House, 2019).

Beyond its medicinal value, marigold extract has been explored as a natural dye for fabrics, particularly cotton garments. Studies on dyeability, wash fastness, light fastness, and antimicrobial properties indicate that marigold dyes maintain color quality even after washing and drying in sunlight or shade. This demonstrates its potential as a sustainable natural colorant in textile production (Harlapur, 2020).

E. *Resort Wear Garment Category*

Resort wear is a fashion category that blends comfort, elegance, and versatility, designed for warm-weather escapes, seaside retreats, and relaxed luxury living. Characterized by breathable fabrics, fluid silhouettes, and vibrant prints, resort wear effortlessly transitions from sun-soaked beaches to evening

gatherings, embodying both leisure and sophistication. Brands within this space showcase unique interpretations of the style:

- **Palm Noosa** celebrates the quintessential Australian beach lifestyle with a modern feminine touch and carefree aesthetics. Its exclusive prints, created in collaboration with local artists, capture the spirit of coastal living.
- **Zimmermann** brings sophisticated femininity to resort wear through clever color pairings and delicate, original prints that have become instantly recognizable worldwide.
- **Soleiluna** embraces subtle elegance and timeless appeal, using organic cottons and airy silks accented with delicate details and antique influences, creating a relaxed gypsy-rock-chic mood for pieces meant to be treasured for a lifetime.
- **Bird and Knoll** channels the effortless charm of coastal living into feminine luxury pieces that flow seamlessly from vacation days to everyday life.
- **Soot** infuses playful wearability into elevated resort wear, drawing inspiration from color, comfort, and the scenic beauty of the Australian coastline.
- **Revolve** catering to Millennial and Gen Z consumers, offers dynamic and accessible resort wear selections, merging trend-driven style with affordability.

Resort wear is more than just a seasonal wardrobe—it's a lifestyle expression, balancing ease and elegance for moments of leisure, travel, and celebration.

II. PROBLEM IDENTIFICATION

Sensitive skin is a common condition in which the skin is easily irritated, leading to redness, itching, burning, or stinging sensations. Such reactions can occur occasionally or frequently and, in some cases, may require consultation with a dermatologist for proper care. Sun allergy, another related concern, is an immune response to sunlight that often results in an itchy, red rash. Choosing clothing made from natural fabrics dyed with natural pigments offers significant benefits for those with sensitive skin. These materials are gentle, breathable, and capable of providing protection against harmful ultraviolet (UV) radiation, reducing the risk of extreme sunburn. By combining comfort, skin health, and eco-friendly practices, natural dyeing supports a sustainable lifestyle that prioritizes both personal well-being and environmental responsibility.

III. AIM & OBJECTIVES

Aim of this project is to develop a resort wear fashion collection for ladies with skin allergic conditions in Sri Lanka by using natural herbal dyeing technique. To achieve that, sub objectives of the project as follows.

- Identify customers demand for new ranges through market research and customer survey, owing to upward trend in enhancing beauty, that provide better esthetics along with improved health and a sense of relief and satisfaction during use. This trend has produced Cosmetotextiles.
- Experiment with natural dyes extractions and practices for get good appearance in fabric, allows workers to avoid exposure to harsh chemicals in health manner.
- Concept and design development with inspiration and fashion range development to cater knish market requirements.
- Fashion product development with innovative feasibility applications and the selected materials.

Nontoxic – natural dyes do not release harmful by products into the environment like synthetic dyes. They are hypoallergenic, which means they are less likely to cause allergic reactions when skin is exposed to them. This is ideal for those with sensitive skin conditions such as eczema, as well as babies and children. Plants used in natural dyes tend to have a number of uses within the community such As food and tea.

IV. METHODOLOGY

This project conducted the deep study on the resort wear garment category with finding out suitable silhouette types, unique features, fabric types and accessories. The study on the fashion trend for spring & summer 2023/24 conducted through fashion web sites, trend predictions in books and magazines and brand study especially with LULU fashion brand.

The knish market was studied through distributing the questioner among urban Sri Lankan ladies in age group 22-26. This analysis is based on a survey of 100 people in age group 22-26 living in urban areas in Sri Lanka, work in 75% in public sector. Information was collected directly from participants and verified by dermatologists.

approaches for the fashion collection as well as the possibility of herbal natural dye extraction with Marigold flower was studied through the books and web sites.

The inspiration, marigold flower (*tagetes erecta*) (Fig.1) possesses medicinal properties, including natural antiseptic and anti-inflammatory effects. It is capable of treating various skin conditions, such as contusions, bruises, and different types of vein disorders. Aesthetic appeal of the Marigold flower was studied as an inspiration through developing concept and design developments (Fig.2).

Fabric selection was done to achieve the desired colour through fabric dying. Natural materials like, cotton, or linen that are selected as appropriate materials for resort wear collection. To get rid of any finishing or sizing chemicals that can interfere with the dye's

absorption, the fabric was pre-washed. Most textile goods come into touch with the skin, herbal treated textiles are a preferable alternative because they do not contain hazardous chemicals and are thus ecofriendly. (Mishra, 2020).

A. Fabric preparation and dyeing with Marigold flower extractions

Thoroughly clean the fabric and soak it in a colour fixative for at least 45 minutes before beginning the dyeing process. This helps the colour adhere evenly to the fabric. A vinegar fixative is ideal for natural plant-based dyes. To prepare, boil the fabric in a solution of vinegar and water at a ratio of 1:4 for one hour. Afterward, rinse the fabric with cold water. Once the fabric is prepared, use a natural dye bath to colour the fabric through tie-dye and direct dyeing methods. Additionally, employ embroidery techniques to enhance the surface decoration. Natural dying with Marigold flower dye and mordanting such as ferrous Sulphate (FeSO₄), Alum, Vinegar, Soymilk was used to improve colour fastness and dyed fabrics were investigated. The cloth was soaked in a mordant solution for a predetermined amount of time and temperature before being rinsed with clean water to complete the mordanting process. Dyeing procedure was conducted to get the appropriate colour tones, the Marigold dye extract was dilute. The pre-treated fabric was soaked in the dye bath for a predetermined amount of time and temperature, either with or without mordanting. Marigold natural dye was extracted by different techniques and used as natural colorants on different fabric types. The ability of Marigold extract dye was concentrated on cotton garments than other fabric types. Dying ability, wash fastness, light fastness, and antibacterial testing of the Marigold dyed fabrics were investigated. As per the results, surface concealment was not affected by washing and drying in the shadow or sunlight. These discoveries demonstrate that Marigold extract concentration may be utilized on cotton garments. The dyed fabric was rinsed thoroughly with clean water to remove excess dye and then air-dried in a shaded area.

B. Concept and design developments

Garment construction steps were conducted to get comfort, breathability, free-size resort wear collection that suitable for tropical climatic situations. To accommodate a variety of body types, the design enhances relative to the several silhouettes types such as caftans, kimonos, and wrap dresses. The developed patterns were followed in the cutting and sewing of the panels of dyed fabric. All the usual processes for making garments were used, along with any finishing touches that were required (Fig.2,3 &4).

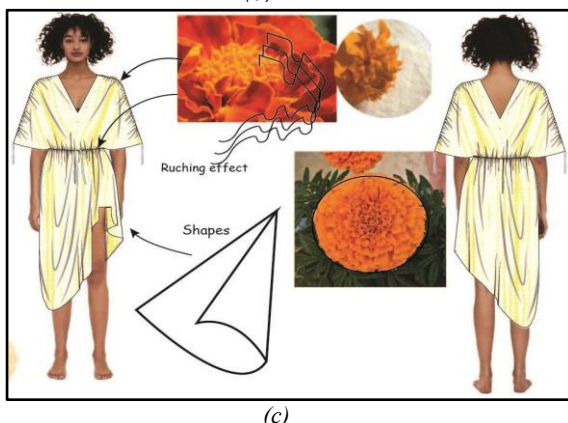
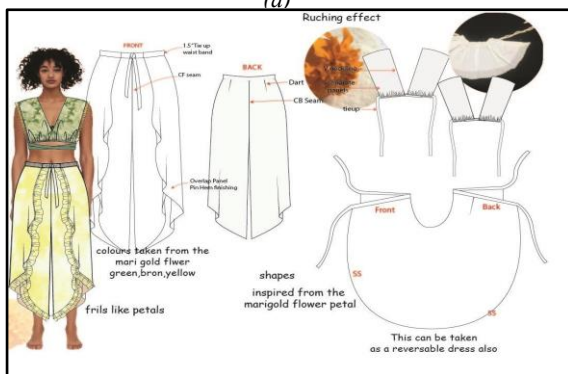


Figure 2: Concept & design developments with inspirational studies.



Figure 3: Front looks of developed final six designs for fashion range development



Figure 4: Back looks of developed final six designs for fashion range development

V. RESULTS & DISCUSSION

This collection is aimed at outgoing, skin-sensitive young ladies in age group 22 to 26. Through the it is found out that, the high prevalence of Skin Issues as a significant majority of participants reported experiencing skin rashes and swelling, limited Clothing Material Awareness among them, limited style variations and the likeness to wear loose fitted dress styles in resort wears regular figure size.

While the WGSN resort wear trends for spring & summer 2023/24 deals with ruffles, asymmetrical cuts, and abstract prints, free-flowing silhouettes like kaftans, fringing, ruching parts, and tie-up details such provides a fashionable and adaptable collection. Natural fabrics and herbal dyes tend to focus on extra care and protection for delicate skin types. Final range of the fashion collection was designed & developed with considering the fashion trend and the inspiration “Marigold flower” and the final design approaches are shown in Fig.2. Fig.3 and 4 shown the illustrations of the front and back look of the six developed designs of the fashion collection. All six designs show free silhouette types with fabric prints with natural dye extraction of “Marigold flower”. knotting, gathering and wrapping techniques were used to fix garments to the body.

Fig.5 shows the feasibility studies of natural dye applications and Fig.6 shows the final appearance of

the six design outfits with live modeling. All outfits were live modelled by a UK size 12 figure. More than the fabric prints with natural dye, resort wear fashion collection was enhanced with simple cut lines, fabric embroidery techniques, tassels, ruffles and frills.

The design drew inspiration from vibrant Marigold flower. Silhouettes mirrored the flower's overall shape, with petals translated into flowing forms. Brushstrokes of the prints were textured to resemble the delicate veins of dried Marigold petals. Fabric manipulation techniques, including frills and fringes, echoed the flower's layered structure. Even the colour palette originated from natural dyes extracted from Marigolds, lending the collection with a touch of organic beauty. Shapes, forms and decorations of the fashion collection inspired by Marigold flower, embraces a relationship with the natural world. Marigolds are a natural dye and are widely available, they provide an environmentally friendly way to add colours. The flower's brilliant low tones will serve as the basis for the colour scheme, while the FeSO_4 will work as a natural modifier to produce a cool green tint. Feasibility testing's that develop with marigold flower extraction is shown in fig. 5.

The concept of "Back to earth" can be seen as a philosophy that emphasizes working in harmony with nature. It prioritizes eco-friendly practices that are sustainable and minimize negative impact on the environment. This holistic approach creates a closed-loop system where human activity supports, rather than disrupts, the delicate balance of our planet.



Figure 5: Feasibility studies of natural dye applications in tie dye/direct dye applications techniques with cotton fabric

Linen and rayon slab fabrics are chosen for their excellent dye absorption properties, eco-friendliness, and breathability. The texture of the slab rayon fabric echoes the Marigold's petal texture, adding a unique visual element.



Figure 6: Live modeling of the finally developed six out fits (a -f).

V. CONCLUSION & RECOMMENDATION

This study delved into utilizing Marigold flowers as a natural dye for crafting a versatile resort wear collection tailored for young Sri Lankan women aged 22-26 residing in urban locales. Through the implemented methodology, a spectrum of Marigold-dyed fabrics was successfully generated, showcasing the viability of this eco-conscious approach. The adoption of natural dyes resonates with the burgeoning interest in sustainable fashion, providing a potential alternative to synthetic dyes fraught with environmental and health issues.

The majority of participants encountered skin-related issues, lacked awareness regarding clothing materials, and felt constrained by stylistic limitations, with a preference for loosely fitted attire. Notably, participants encompassed diverse body sizes and shapes. Skin ailments are prevalent in urban settings and public-sector workplaces, attributed to environmental factors, inadequate consideration of clothing materials, and limited access to suitable fabrics.

Moreover, the potential hypoallergenic properties of Marigold dye present an added advantage, particularly for individuals with sensitive skin. Although further research is warranted to conclusively ascertain its hypoallergenic attributes, the gentle and natural characteristics of Marigold dye suggest its potential for causing less irritation compared to synthetic counterparts.

This research advocates for deeper exploration of Marigold dye within resort wear design. Future endeavours could concentrate on refining dye extraction techniques, selecting suitable mordants, experimenting with fabric blends, investigating hypoallergenic properties, and devising free-size designs. Such endeavours could cement Marigold dye's standing as a sustainable option for crafting comfortable, hypoallergenic resort wear.

The resort wear collection integrates tie-dye techniques with natural fabrics—such as cotton, chiffon, linen, and natural silk—to echo the delicate beauty of marigold flower petals. These materials were selected for their compatibility with resort wear aesthetics and their ability to optimally showcase vibrant colours and intricate tie-dye patterns. Ruffles highlight the floral petal forms, while pleats convey graceful, flowing lines. This design approach not only captures the essence of nature-inspired elegance but also paves the way for potential technological innovations that promote sustainability in contemporary fashion and clothing practices.

ACKNOWLEDGMENT

Here is expressing the hatful of gratitude to the Department of Textile & Apparel Technology, Faculty of Engineering Technology, The Open University of Sri Lanka, for providing this opportunity to conduct this research attached to the Bachelor of Industrial Studies - Fashion Design and Product Development degree programme.

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