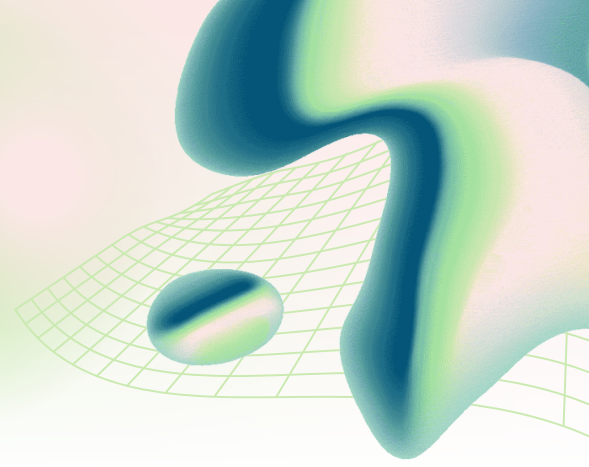


ROOTED IN HOPE: BOTANCIAL CROWN COLLECTION

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Rooted in Hope: The Botanical Crown Collection explores how bio-based textiles, natural dye processes, and Afrocentric hair aesthetics can be integrated through digital fabrication and sustainable design practices to create culturally affirming, non-toxic alternatives to traditional wigs and hair systems. Grounded in the intersection of fashion, material innovation, cultural identity, and wellness, the project investigates how textile-based hair structures can function as both wearable design and a form of personal and collective storytelling. Through the use of naturally dyed fibers, experimental yarn manipulation, and sculptural Afrocentric forms, the work challenges the environmental and health concerns associated with synthetic hair products while reimagining hair as a sustainable, expressive, and culturally significant material. By combining traditional craft practices with emerging fabrication technologies, *Rooted in Hope* proposes a future-facing model for beauty and fashion that prioritizes ecological responsibility, emotional well-being, and authentic representation within the design process.

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Introduction: The Roots

Rooted in Hope: The Botanical Crown Collection explores the intersection of African diasporic hair traditions, sustainable textile practices, natural dye experimentation, and digital fabrication through the creation of sculptural wearable crowns. Rooted in the cultural significance of Black hair as identity, adornment, resistance, and storytelling, this research reimagines contemporary hair art through biochromes derived from botanical materials such as indigo, madder root, black walnut, onion skins, and turmeric. The project combines traditional handcrafting techniques including braiding, wrapping, curling, and embellishment with emerging technologies such as laser cutting, digital patterning, and fabrication methods developed through Fab Lab practices. By referring to these wearable pieces as crowns rather than wigs, the collection centers dignity, heritage, empowerment, and cultural memory while challenging conventional beauty narratives and expanding conversations surrounding sustainable fashion, Afrocentric design, and wearable art.

Review of Literature: The Foundation

The following review of literature examines the intersections of sustainability, Afrocentric design, hair culture, wellness, and material innovation as they relate to the development of *Rooted in Hope*: The Botanical Crown Collection. This section explores existing scholarship surrounding toxic dyes, environmental concerns within the textile and wig industries, hair waste as a sustainable material resource, and the growing demand for safer and more culturally affirming alternatives in wearable hair systems. Additionally, the literature highlights the social and emotional significance of Black hair while examining artists and designers whose work informs the project's conceptual and visual framework. Together, these studies and creative influences establish the theoretical foundation for *Rooted in Hope* by positioning crowns as sites of cultural storytelling, healing, sustainability, and identity-centered design.

Addressing Toxic Dye Challenges

A growing body of research identifies synthetic dyes and chemical colorants as significant concerns within the textile, beauty, and hair industries. Synthetic dyes are commonly used because they provide vibrant colors, durability, and low production costs; however, many contain chemical compounds associated with skin irritation, allergic reactions, and environmental toxicity. Within hair products, ingredients such as para-phenylenediamine (PPD), ammonia, and formaldehyde-releasing agents have been linked to scalp irritation, dermatitis, inflammation, and long-term sensitivity issues, particularly among individuals with sensitive skin or preexisting scalp conditions. ([pmc.ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/)). These concerns are especially relevant within the wig and beauty industry, where synthetic fibers and chemically processed hair are frequently worn for extended periods of time in direct contact with the scalp. Black women, in particular, are disproportionately exposed to chemically processed hair products due to social pressures surrounding hair texture, styling practices, and Eurocentric beauty standards. Scholars examining Black hair culture have emphasized how beauty practices are deeply tied to identity, professionalism, and social acceptance, creating conditions where individuals may repeatedly use products despite potential health concerns. At the

same time, sustainable fashion researchers and designers have increasingly explored natural dye alternatives derived from plants, minerals, and food waste. Examples include the use of turmeric for yellow pigments, madder root for reds, indigo for blues, onion skins for warm golds and browns, and black walnut for deep earth tones. Designers and textile artists have demonstrated that natural dyes can produce rich, complex color systems while reducing chemical pollution.

Despite this growing interest, a major gap remains in research focused specifically on natural dyes applied to textile-based wigs and Afrocentric hair systems. Much of the current scholarship examines sustainable textiles or cosmetic hair dyes independently, rather than exploring how naturally dyed fibers can function within wearable hair structures. *Rooted in Hope* addresses this gap by investigating how biochrome-dyed yarns and fibers can create safer, non-toxic, and culturally expressive alternatives to conventional wig production.

Environmental Impact

Synthetic dyes contribute significantly to environmental pollution, particularly through textile manufacturing and disposal processes. Textile dye wastewater often contains heavy metals, toxic compounds, and non-biodegradable substances that contaminate rivers, groundwater, and ecosystems. Studies show that many synthetic dyes resist natural degradation and may remain in waterways long after disposal, negatively affecting aquatic organisms, plant systems, and surrounding communities. ([sciencedirect.com](https://www.sciencedirect.com))



Figure 1. Industrial dye pollution in waterways, demonstrating the environmental impact of toxic synthetic dyes used in textile and beauty industries.

The beauty and wig industries also contribute to environmental degradation through the large-scale use of petroleum-based synthetic fibers. Synthetic wigs are commonly produced using acrylic, polyester, and plastic-based materials that are not biodegradable and often discarded after relatively short use cycles. As a result, these products contribute to landfill accumulation and microplastic

pollution. Within sustainable fashion discourse, scholars and designers have increasingly advocated for circular design systems that reduce waste through reuse, biodegradability, and regenerative production methods. Examples include biomaterials research, closed-loop textile systems, and waste-based fashion experimentation. Projects such as the *Human Material Loop* demonstrate innovative approaches to repurposing discarded biological materials, including human hair, into functional textile resources. However, current research rarely addresses the environmental implications of the wig industry specifically, particularly within Afro-textured and culturally specific hair products. There is limited scholarship examining how sustainable fibers, natural dyes, and biodegradable construction methods can be integrated into hair systems. *Rooted in Hope* contributes to this emerging conversation by proposing wigs and crowns constructed from naturally dyed yarns and fiber-based materials that prioritize ecological responsibility alongside aesthetic and cultural expression.

Hair Waste

Hair waste represents a largely untapped material resource within sustainability and textile innovation research. Human hair is typically discarded in salons, homes, and manufacturing facilities despite its durability, flexibility, and potential use as a natural fiber. Researchers and designers have begun exploring hair as a material for insulation, filtration systems, composite materials, fashion accessories, and experimental textiles. The *Human Material Loop* is one notable example, positioning hair waste as a renewable resource capable of reducing reliance on conventional textile fibers. In artistic and conceptual fashion spaces, hair has also been used symbolically to address identity, memory, ancestry, and embodiment.



Figure 2. Discarded human hair collected from salons and barbershops, illustrating hair waste as a potential sustainable material source for textile and design applications.

Artists such as Laetitia Ky transform natural hair into sculptural forms that challenge traditional beauty standards and communicate themes of resistance, imagination, and empowerment. Similarly, Nick

Cave uses textured, hair-like materials in his *Soundsuits* to explore identity, protection, race, and movement through wearable sculpture. Zanele Muholi further explores hair-inspired forms as expressions of ancestry, ritual, and Black identity. Despite these examples, the literature surrounding hair waste often remains rooted in material science or environmental engineering rather than cultural design practice. There is limited research connecting hair waste, Afrocentric aesthetics, sustainable wig systems, and culturally affirming fashion design. *Rooted in Hope* expands this discussion by reframing hair not only as a discarded material, but as a culturally charged medium capable of storytelling, healing, and sustainable innovation.

Safe Alternatives

The need for non-toxic alternatives in wigs and hair systems has become increasingly important as awareness grows regarding chemical exposure and scalp health. Research on cosmetic allergies and hair product sensitivity indicates that ingredients commonly found in hair dyes, adhesives, synthetic fibers, and preservatives may contribute to irritation, inflammation, and allergic reactions. ([mdpi.com](https://www.mdpi.com)). For individuals experiencing hair loss due to chemotherapy, alopecia, lupus, hormonal conditions, or stress-related shedding, comfort and scalp sensitivity become especially critical. Many conventional wigs trap heat, reduce breathability, and expose already sensitive skin to synthetic materials and chemical residues. This creates both physical discomfort and emotional distress for users seeking products that support dignity and confidence during vulnerable experiences. At the same time, wellness-centered beauty movements have encouraged greater transparency around ingredients, sustainability, and ethical production practices. Consumers increasingly seek products aligned with holistic health and environmentally responsible values. However, there remains limited availability of wig systems that simultaneously prioritize:

- non-toxic materials
- breathability
- sustainability
- cultural authenticity
- aesthetic innovation
- emotional well-being

Rooted in Hope addresses this gap through the development of lightweight, naturally dyed, fiber-based wigs and crowns that combine sustainable textile methods with Afrocentric design principles. By integrating wellness, fashion, and material innovation, the project proposes alternatives that are both physically safer and emotionally affirming.

Social Relevance

Hair loss can significantly affect emotional well-being, confidence, identity, and social participation. Research on alopecia and chemotherapy-related hair loss demonstrates that many individuals experience anxiety, depression, reduced self-esteem, and altered perceptions of femininity or self-image as a result of losing hair ([pmc.ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov)). Wigs and hairpieces therefore function not only as cosmetic products, but also as tools for emotional support, self-expression, and identity restoration. For Black women, hair carries additional cultural, historical, and political significance. Black hair has long functioned as a site of identity formation, resistance, creativity, and cultural pride. Hairstyles such as braids, twists, locs, cornrows, and wraps hold deep connections to ancestry,

community, and self-definition. At the same time, Black women have historically faced discrimination and pressure to conform to Eurocentric beauty standards in professional, educational, and social spaces. Recent cultural movements, including the natural hair movement and legislation such as the CROWN Act, have increased visibility around issues of hair discrimination and representation. Yet despite this progress, many commercially available wigs still prioritize straight textures and Eurocentric aesthetics while offering limited culturally authentic alternatives rooted in Afro-textured beauty traditions.



Figure 3. Image showing alopecia and hair thinning patterns, highlighting hair loss conditions that can impact identity, self-expression, and cultural relationships to hair.

Rooted in Hope is socially relevant because it positions sustainable wig design as both a cultural and wellness-centered intervention. By centering Afrocentric aesthetics, natural materials, and emotionally affirming design practices, the project challenges dominant beauty norms while creating space for representation, healing, and self-defined identity. Ultimately, it demonstrates how fashion and material innovation can operate as tools for cultural empowerment, sustainability, and holistic care.

Design Inspirations and Conceptual Influences

The conceptual foundation of *Rooted in Hope* is informed by artists and designers whose work challenges conventional understandings of hair, adornment, sustainability, identity, and the body. The practices of Laetitia Ky, Zanele Muholi, Nick Cave, and Zsafia Kollar collectively shape the visual language and theoretical direction of the project. Each creator contributes a unique perspective on materiality, culture, performance, and sustainability that directly informs the development of *Rooted in Hope* as a wearable, Afrocentric, and bio-based design system (English, 2013; Kawamura, 2005).

Laetitia Ky

Laetitia Ky is widely recognized for transforming natural Afro-textured hair into intricate sculptural forms that function as visual storytelling devices. Using her own hair as both medium and message, Ky creates gravity-defying structures that resemble trees, hands, horns, snakes, symbols, and architectural forms. Her work exists at the intersection of sculpture, fashion, performance, activism, and cultural commentary, positioning hair as a site of both political resistance and creative liberation (Ky, 2020). Ky's work is deeply rooted in African identity and challenges Eurocentric beauty standards that have historically marginalized natural Black hair textures (Banks, 2000; Byrd & Tharps, 2014). Rather than concealing or altering Afro-textured hair to conform to dominant ideals, she amplifies its texture, volume, and structural capabilities. Through this approach, hair becomes an instrument of empowerment, autonomy, and self-definition (hooks, 1992).

A significant aspect of Ky's work is its use of symbolism and bodily storytelling. Many of her sculptural hairstyles address themes such as womanhood, colonialism, sexuality, social justice, and bodily autonomy. Her use of branching and root-like forms evokes ancestry, growth, connection, and survival, while also suggesting movement and transformation. This conceptual framework strongly informs *Rooted in Hope*, particularly in the project's exploration of crowns and textile wigs as sculptural extensions of identity and memory.

Ky's influence on *Rooted in Hope* can be seen in:



Figure 4. Laetitia Ky hair sculpture inspired by Medusa, using natural hair to explore themes of power, identity, and African artistic expression.

- the use of exaggerated Afrocentric forms

- the transformation of hair into sculptural architecture
- the merging of body and adornment
- the use of wearable forms as cultural narratives
- the celebration of Black beauty through natural textures

Most importantly, Ky demonstrates that hair itself can function as a powerful artistic material rather than simply a cosmetic feature. This perspective encourages *Rooted in Hope* to approach wigs and textile crowns not as replacements for hair, but as symbolic and expressive forms that embody culture, healing, and imagination.

Zanele Muholi

Zanele Muholi's work provides critical inspiration through its exploration of Black identity, adornment, visibility, ritual, and resistance. Muholi, who identifies as a visual activist rather than simply a photographer, creates highly stylized black-and-white portraits that center Black queer identity while interrogating systems of race, gender, and representation (Muholi, 2020). A defining feature of Muholi's work is the transformation of everyday materials into dramatic sculptural adornments. Objects such as rope, rubber tubing, clothespins, wigs, cords, and braided materials are repurposed into elaborate wearable forms that surround and reshape the body. These materials often echo the visual language of hair, weaving, and textile construction while simultaneously addressing histories of labor, domesticity, survival, and resilience.

Muholi's portraits are deeply performative and ceremonial. The body becomes both archive and monument, carrying histories of oppression, beauty, and cultural memory. Through intense contrasts, direct gaze, and sculptural styling, Muholi elevates Blackness into a position of power, visibility, and reverence (hooks, 1992).

This perspective directly informs *Rooted in Hope* in several ways:



Figure 5. Portrait by Zanele Muholi from the *Somnyama Ngonyama* series, exploring Black identity, adornment, and self-representation through visual activism and Afrocentric aesthetics.

- the use of adornment as protection and empowerment
- the integration of ritualistic and ancestral visual language
- the elevation of Afrocentric aesthetics within wearable design

- the transformation of ordinary materials into culturally charged forms
- the positioning of the body as a site of storytelling and resistance

Muholi's influence is particularly important to the emotional and cultural dimensions of *Rooted in Hope*. The project similarly seeks to create wearable forms that affirm identity and challenge dominant beauty narratives, especially for Black women navigating hair loss, visibility, and self-expression (Williams, 2019).

Nick Cave (Soundsuits)

Nick Cave's *Soundsuits* are among the most influential examples of wearable sculpture and performative fashion in contemporary art. Constructed from found materials such as yarn, beads, buttons, synthetic hair, twigs, raffia, fabric, toys, and fibers, the *Soundsuits* blur the boundaries between fashion, sculpture, costume, dance, and performance (Cave, 2014). Originally inspired by experiences of racial violence and social injustice, the *Soundsuits* function as protective shells that conceal markers of race, gender, and class. By obscuring the wearer's identity, Cave creates space for movement, transformation, and reinterpretation. The suits activate through motion, producing sound, texture, and rhythm as the body moves within them.

Materiality plays a central role in Cave's work. His garments are highly tactile, layered, and exaggerated, often expanding beyond the body into sculptural forms that challenge conventional silhouettes. Hair-like fibers, fringe, fur, and textured surfaces create movement and sensory engagement, transforming the garments into living systems rather than static objects (Quinn, 2002).

Within *Rooted in Hope*, Cave's influence appears through:



Figure 6. *Soundsuit* by Nick Cave illustrating wearable sculpture through vibrant textiles, texture, movement, and identity-centered artistic expression.

- the exploration of wearable sculpture
- exaggerated textile forms and silhouettes
- movement-based design
- layered textures and fiber density
- the concept of garments as emotional and protective spaces
- the use of adornment as performance and identity transformation

Cave's work also reinforces the project's interest in multisensory and embodied design. The crowns and wigs developed within *Rooted in Hope* are intended not only to be visually expressive, but also to engage with movement, texture, volume, and physical presence in ways that activate the body and space around it.

Zsofia Kollar

Zsofia Kollar's work is especially significant to *Rooted in Hope* because of her direct engagement with hair as a sustainable and unconventional material resource. Kollar investigates the material properties of human hair and explores how discarded hair can be repurposed into textiles, jewelry, surfaces, and wearable objects within circular design systems (Kollár, 2018). Her work challenges cultural assumptions about waste by repositioning human hair as a renewable biomaterial rather than something disposable or undesirable. Hair's durability, flexibility, strength, and abundance make it an intriguing alternative material within sustainable fashion and product design research (Fletcher, 2014). Kollar's experimental approach demonstrates how biological materials can operate within innovative

design systems while also carrying emotional and symbolic meaning. Hair occupies a unique position because it is simultaneously intimate, cultural, biological, and aesthetic. Once detached from the body, however, it is often treated as waste despite its material potential.

Kollar's influence appears through:



Figure 7. Garment constructed from human hair fiber, demonstrating the potential of hair as a sustainable textile material within experimental fashion and wearable design.

- circular material systems
- sustainable biomaterial experimentation
- unconventional textile practices
- waste-to-resource thinking
- material innovation through biological fibers
- the intersection of science, design, and sustainability

Her work also supports the broader ecological goals of *Rooted in Hope*, particularly its commitment to reducing reliance on petroleum-based synthetic wigs and chemically processed materials through biodegradable and naturally derived alternatives (Gwilt, 2020; Black, 2012). Together, these artists and designers establish the conceptual and material framework for *Rooted in Hope*. Their collective influence demonstrates how hair, textiles, and wearable forms can operate simultaneously as cultural symbols, sculptural systems, sustainable materials, and tools for empowerment. Through their work, *Rooted in Hope* positions Afrocentric design and bio-based material innovation as pathways toward a more inclusive, sustainable, and emotionally resonant future within fashion and wearable art (Sullivan, 2010; Fletcher, 2014).

The Process: Our Methodology

Material Preparation and Natural Dye Methodology

The methodology for *Rooted in Hope* combines traditional textile dye practices with sustainable material experimentation to investigate the development of bio-based, naturally dyed textile hair systems. Central to the project is the preparation and dyeing of 100% cotton and 100% wool yarns using plant-derived colorants and environmentally conscious mordanting techniques. The methodology emphasizes sustainability, material safety, and color experimentation while examining

how natural dyes interact differently with protein-based and cellulose-based fibers. The research process was practice-based and experimental, involving iterative testing of dye absorption, colorfastness, texture, and fiber behavior. Both warm and cold mordanting methods were explored to determine how different preparation techniques affected dye uptake and final coloration outcomes. This process aligns with sustainable textile research practices that prioritize low-toxicity methods and reduced environmental impact (Fletcher, 2014; Black, 2012).

Mordanting Process

Purpose of Mordanting

Mordanting is a critical preparatory process in natural dyeing that improves the bond between dye molecules and textile fibers. Mordants help increase colorfastness, durability, and color intensity while allowing fibers to retain pigment through washing and wear. In this project, alum (potassium aluminum sulfate) was selected as the primary mordant because it is widely regarded as one of the safest and least toxic mordants used in natural dye processes (Cardon, 2007). Both 100% cotton and 100% wool yarns were mordanted prior to dyeing; however, each fiber required different preparation approaches because of the structural differences between cellulose fibers (cotton) and protein fibers (wool).

Mordanting 100% Cotton Yarn

Cotton yarn, as a cellulose fiber, has a lower natural affinity for dyes compared to wool and therefore requires a more extensive mordanting process to improve dye absorption. Prior to mordanting, the cotton yarn was thoroughly scoured using a mild detergent wash to remove oils, waxes, and manufacturing residues that could interfere with dye penetration. After scouring, the cotton yarn was mordanted using an alum bath. The alum solution was prepared using approximately 15% weight of fiber (WOF) alum dissolved in warm water. The yarn was submerged into the mordant bath and gradually heated to a low simmer for approximately one hour while being gently stirred to ensure even absorption. In addition to traditional hot mordanting, the project explored cold mordanting techniques using Aluminum Triformate, a cold mordant commonly used in sustainable natural dye practices. The cotton yarn was soaked in a cold mordant solution over an extended period typically 12 to 24 hours to allow the mordant to penetrate the fibers without the need for continuous heat energy. This approach supported the project's sustainability goals by reducing energy consumption while also preserving the softness and integrity of the yarn structure. Following mordanting, the yarn was rinsed lightly and allowed to rest before entering the dye baths.

Mordanting 100% Wool Yarn

Wool yarn, a protein-based fiber, naturally bonds more readily with natural dyes due to the amino acids present in the fiber structure. Because wool is more delicate and sensitive to temperature fluctuations, the mordanting process required careful handling to avoid felting or fiber damage. The wool yarn was gently scoured using lukewarm water and mild soap to remove oils and impurities. Alum mordant was then applied using approximately 10–15% WOF alum dissolved into warm water. The wool was slowly heated and maintained at a low temperature rather than a rolling boil to protect the integrity of the fibers. Cold mordanting was also explored with the wool yarn using Aluminum Triformate. The yarn was submerged in a room-temperature mordant bath and allowed to soak

gradually over time. This process was particularly effective in preserving the softness, elasticity, and texture of the wool while supporting lower-impact dye practices.

Natural Dye Process

Following mordanting, both cotton and wool yarns were dyed using a series of plant-based dyes selected for their historical use, sustainability, symbolic color associations, and potential application within Afrocentric wearable design. The dyes included turmeric, black beans, madder root, black walnut, and onion skins. The dyeing process emphasized experimentation and documentation, with each yarn sample photographed and cataloged throughout the process.

Experimental Dye Variations and pH Modifications

An important component of the *Rooted in Hope* methodology involved experimentation with pH modifiers and extraction variations in order to explore the full chromatic potential of natural dyes. Natural dyes are highly reactive to environmental conditions such as temperature, water composition, mordants, and pH balance. Because of this sensitivity, small chemical adjustments using common household materials such as vinegar and baking soda can significantly alter final color outcomes. These experiments allowed the project to investigate not only sustainability and material safety, but also the aesthetic flexibility and expressive possibilities of bio-based dye systems. The variation testing aligned with the project's emphasis on iterative material exploration and practice-based research, while also reflecting historical natural dye traditions in which artisans manipulated minerals, acids, tannins, and alkaline solutions to achieve expanded color palettes.

Turmeric Dye

Turmeric (*Curcuma longa*) was used to produce vibrant yellow and golden tones. The turmeric powder was simmered in water to extract pigment before strained dye baths were prepared. Both cotton and wool yarns absorbed turmeric readily, though wool generally produced richer and warmer saturation because of its protein structure. Turmeric produced bright organic hues associated with warmth, sunlight, healing, and vitality. However, literature on turmeric dye notes that it has moderate lightfastness, meaning the color may fade over time with prolonged exposure to sunlight (Dean, 2010). Despite this limitation, turmeric was valuable within the project because of its symbolic connection to wellness, earth-based pigments, and natural beauty traditions. The initial turmeric bath was created by simmering turmeric powder in water before straining the solution. The wool yarns absorbed the dye readily, though wool produced deeper and more saturated golden tones because of its protein-based structure.



Figure 8. Wool yarn dyed with turmeric, demonstrating the vibrant yellow tones achieved through natural dye processes.

Turmeric Dye Variations

Turmeric naturally produces bright yellow and golden hues due to the presence of curcumin pigments. While turmeric is known for its vibrant coloration, one of the most compelling aspects of the dye is its responsiveness to pH changes. Within *Rooted in Hope*, experiments using vinegar and baking soda demonstrated how turmeric could shift dramatically in tone, creating expanded visual possibilities for Afrocentric textile crowns and wigs.



Figure 9. Turmeric dye bath experiments with modifier variations, illustrating the influence of additives on natural dye color development.

Turmeric + Vinegar (Acidic Modification)

Vinegar was introduced into select turmeric dye baths to create a more acidic environment. The addition of vinegar showed a brightness of the turmeric. The acidic solution also appeared to improve consistency in some wool samples by allowing more gradual pigment absorption.

Turmeric + Baking Soda (Alkaline Modification)

One of the most dramatic transformations occurred when baking soda was introduced into the turmeric dye bath. Turmeric is highly pH sensitive, and the alkaline environment caused the curcumin pigments to shift away from yellow toward deeper orange-brown tones. These transformations expanded the visual range of turmeric significantly beyond its traditional yellow coloration. This

experiment demonstrated the ability of natural dyes to create multiple color stories from a single plant source while maintaining a non-toxic and environmentally conscious process.



Figure 10. Comparison of turmeric-dyed wool yarn samples, showing color variation produced through different mordants and modifiers.

Black Bean Dye

Black beans were used to produce soft gray, lavender, blue-gray, and muted purple tones. Unlike heated dye processes, black bean dyeing is often performed through cold extraction methods because excessive heat can diminish the color-producing anthocyanins. The beans were soaked in water overnight to release pigment naturally. The wool yarns were then submerged into the cool dye bath for two days. The use of black beans aligned strongly with the project's sustainability goals because it utilized food-based dye materials that are accessible, biodegradable, and low toxicity.

Black Bean Dye Variations

An important area of experimentation within *Rooted in Hope* involved exploring the color variability of black bean dye when modified through different natural mordants and pH-altering agents on 100% wool yarns. Black beans are particularly significant within natural dye research because of their anthocyanin pigments, which are highly responsive to chemical and mineral shifts, allowing a wide range of color transformations to emerge from a single botanical source. Throughout this project, nine separate variations were tested using modifiers including baking soda, turmeric with iron, soda ash, pickling lime, cream of tartar, vinegar, iron, alum, and soy. Each modifier altered the pH balance or fiber interaction differently, resulting in distinct tonal shifts ranging from muted lavenders and smoky blues to grays, soft purples, earth tones, and deeper shadowed hues such as olive. These experiments demonstrated how natural dye systems can create complex and unpredictable color palettes without relying on synthetic chemical dyes.



Figure 11. Black beans used as a natural dye source for creating soft blue, gray, and lavender tones on textile fibers.

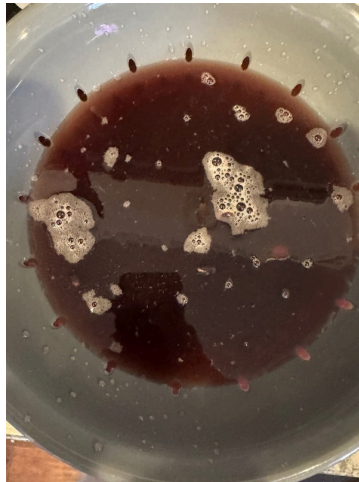


Figure 12. Black bean dye bath prepared for natural dye extraction and textile experimentation.



Figure 13. Naturally dyed yarn and hair samples produced from black bean dye experiments, demonstrating color variation across different materials.



Figure 14. Collection of naturally dyed yarn samples illustrating tonal variations achieved through black bean dye processes and modifiers.

Madder Root Dye

Madder root (*Rubia tinctorum*) was selected for its historical significance as one of the oldest natural red dyes used in textile production. Madder produced a range of warm reds, rusts, terracotta tones, and pink-orange variations depending on fiber type and mordant concentration. The madder root was soaked and slowly heated to release alizarin pigments into the dye bath. Wool fibers yielded particularly rich and saturated reds, while cotton produced softer earth-toned variations like a salmon hue.



Figure 15. Madder root powder measured for use in natural dye extraction and textile coloration experiments.



Figure 16. Madder root dye bath prepared for natural dyeing, illustrating the rich red and orange pigment extraction process.



Figure 17. Yarn and hair samples immersed in a madder root dye bath during the natural dyeing process.



Figure 18. Naturally dyed yarn samples produced with madder root, demonstrating variations of pink, rust, and terracotta tones achieved through natural dye methods.

Black Walnut Dye

Black walnut hulls were used to create deep brown, smoky charcoal, and earthy neutral tones. Black walnut is known for its strong tannin content, which allows it to bond effectively with fibers even

without heavy mordanting. The walnut hulls were simmered for extended periods to extract rich pigments. Wool fibers absorbed particularly dark and dramatic coloration, while cotton produced softer brown and sepia shades.



Figure 19. Black walnut dye bath prepared for natural dye extraction, producing deep brown and earthy color tones for textile applications.



Figure 20. Yarn immersed in a black walnut dye bath during the natural dyeing process, illustrating pigment absorption across fiber materials.



Figure 21. Naturally dyed yarn samples produced with black walnut dye, demonstrating tonal variations from soft beige to rich brown hues.



Figure 22. Comparison of black walnut dyed yarn samples showing differences in shade and depth achieved through natural dye experimentation.

Onion Skins Dye

Yellow and red onion skins were collected and simmered to produce warm gold, amber, orange, and rust tones. Onion skins are widely recognized within natural dye traditions for their accessibility and ability to produce luminous earth tones. Both yellow onion skins and red onion skins were explored separately to investigate the range of warm and cool earth pigments possible through food-waste dyeing systems. The use of onion skins aligned strongly with the project's sustainability goals because they repurpose commonly discarded organic waste materials into valuable color resources. Yellow onion skins produced an golden amber color. The skins were simmered slowly to extract pigment before yarn immersion. Wool fibers absorbed vibrant golden tones, while cotton produced softer straw and muted tan variations. Red onion skins produced a dusty lavender color. The unpredictability of red onion dye highlighted the organic and living nature of natural dye systems.



Figure 23. Yellow onion skins prepared as a natural dye source for textile coloration experiments.



Figure 24. Wool yarn immersed in a yellow onion skin dye bath during the natural dyeing process.



Figure 25. Red onion skins prepared for natural dye extraction to produce warm pink and copper tones on textile fibers.



Figure 26. Wool yarn dyed with red onion skins, illustrating color development during the natural dyeing process.



Figure 27. Naturally dyed yarn samples produced with onion skin dyes, demonstrating soft peach, tan, and copper color variations.

Results: How the Magic Happens

The results of Rooted in Hope: The Botanical Crown Collection demonstrated that natural dyes can successfully function as sustainable, culturally expressive, and aesthetically dynamic alternatives to synthetic colorants within wearable crown construction. Across all dye experiments, the wool and cotton yarns showed strong dye absorption, particularly the wool fibers, whose keratin structure enhanced color vibrancy, texture, and dimensionality within the final crown designs. The project confirmed that botanical dyes not only produced visually rich and varied palettes, but also supported sculptural styling techniques such as wrapping, pin curling, twisting, rod setting, and beading. The resulting crowns reflected both functional wearability and artistic expression while reinforcing themes of Afrocentric beauty, sustainability, and healing.

Turmeric

Turmeric dye produced some of the most vibrant and visually striking results within the collection. As shown in the turmeric experimentation slides, the use of acidic and alkaline modifiers significantly altered the final coloration of the yarns. The vinegar bath generated a bright, saturated yellow, while the baking soda bath shifted the yarn toward warmer orange and earthy tones. These tonal differences created a successful two-tone effect within the final curly fro crown, demonstrating how pH variation can expand the visual complexity of natural dye systems. Additionally, turmeric's antimicrobial properties aligned with the project's wellness-centered focus, reinforcing the potential for safer and scalp-conscious alternatives to synthetic dyes. The turmeric crowns embodied warmth, visibility, and vibrancy while showcasing the ability of natural dyes to produce bold statement aesthetics. The turmeric-dyed wool yarn was tightly wrapped around small dowel rods and allowed to dry completely in order to create structured spiral curl formations. Once removed from the rods, the yarn retained tight, spring-like curls that added volume, texture, and sculptural dimension to the final crown design. The bright yellow turmeric-dyed yarn formed the majority of the crown, creating a vibrant and energetic visual presence, while the softer orange-toned yarns were strategically placed along the sides to introduce warmth, depth, and subtle tonal variation within the overall composition.

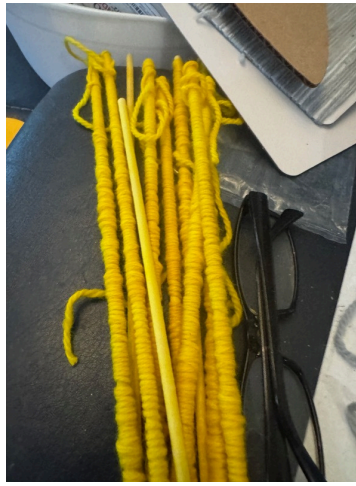


Figure 28. Wool yarn wrapped around rods in preparation for creating spiral curl structures prior to turmeric dyeing.



Figure 29. Naturally dyed turmeric yarn samples displaying bright yellow and muted golden color variations after the dyeing and curing process.



Figure 30. Turmeric-dyed spiral curls attached to a mesh wig base during the construction phase of the botanical wig prototype.



Figure 31. Completed turmeric botanical wig prototype featuring dense spiral-textured curls inspired by natural forms, Afrocentric hairstyling traditions, and sustainable dye practices.



Figure 32. Model Olyvia in the turmeric-dyed botanical wig prototype, demonstrating the vibrancy and sculptural qualities achieved through natural dye experimentation with turmeric.

Blackbeans

The black bean dye experiments yielded some of the most conceptually significant findings due to the extensive range of tonal variation achieved through modifiers and pH experimentation. Using black bean anthocyanin pigments, nine separate variations were developed through additives including baking soda, turmeric/iron, soda ash, pickling lime, vinegar, iron, alum, soy, and cream of tartar.

These modifiers transformed the yarns into soft gray-blues, muted lavenders, cool neutrals, smoky taupes, pale violets, and earth-toned shades. The results demonstrated that black bean dye possesses exceptional versatility when applied to wool yarns, particularly within sculptural and textured crown forms. The Blackbean Twists with Beads crown successfully integrated blue-toned beads and twisted yarn structures to enhance movement and visual rhythm, while the Blackbean Short Bob Variation further highlighted the adaptability of the dyed fibers through cutting, blow drying, and heat-curled styling techniques. These experiments confirmed that botanical dyes can support not only color application but also advanced styling manipulation comparable to traditional synthetic hair systems.



Figure 33. Close-up detail of naturally dyed yarn strands attached to the mesh wig base, displaying soft tonal variations of lavender, gray, cream, and muted blue produced through botanical dye experimentation.



Figure 34. Completed botanical wig prototype featuring layered yarn strands with subtle multicolored natural dye effects and textured curl formations inspired by fiber artistry and Afrocentric aesthetics.

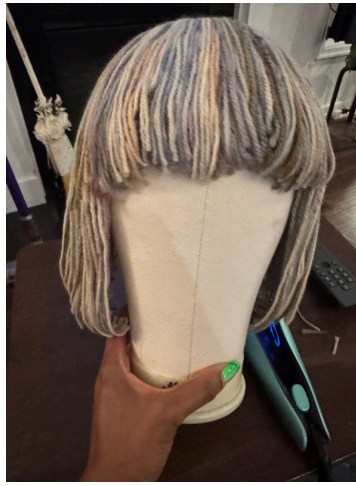


Figure 35. *Styled botanical wig prototype displayed with a sculpted bob silhouette and straightened yarn arrangement to explore alternative texture and form variations within the collection.*



Figure 36. *Model Brooke is modeling the multicolored botanical wig prototype, demonstrating the integration of naturally dyed yarn, sculptural form, and wearable textile art within the completed design collection.*



Figure 37. *Initial construction of the gray black bean-dyed wig showing twisted yarn strands secured to the wig foundation.*



Figure 38. Completed gray-toned wig prototype emphasizing texture, movement, and handcrafted fiber techniques.



Figure 39. Beaded embellishment stage of the black bean wig incorporating blue translucent and opaque beads for added texture and visual interest.



Figure 40. Model Navy is showcasing the black bean-dyed and beaded wig, demonstrating the wearable and expressive qualities of the botanical crown collection.

Madder Root

Madder root produced rich warm reds, terracotta tones, and dusty pink variations that contributed softness and historical depth to the collection. The dye bath preparation using 100 grams of madder

root at 100% WOF for mordanted cotton and wool resulted in highly saturated warm tones with strong visual richness. The final Madder Root Two-Tone Pin Curl Wrap crown demonstrated successful integration of braided structures, pin curls, and layered wrapping methods. The combination of cotton and wool fibers produced dimensional tonal variation and texture, allowing the final crown to mimic the complexity and density of natural hair forms. Madder root's historical association with ancient textile traditions further strengthened the project's connection between ancestral craft practices and contemporary Afrocentric design.



Figure 41. Madder root botanical crown constructed with crocheted yarn roses in warm blush, terracotta, and rust tones, demonstrating the layered floral textures achieved through natural dye experimentation.



Figure 42. Model Dennell is modeling the madder root botanical crown, highlighting sculptural floral forms and the rich pink-orange color variations produced through madder root dyeing.

Black Walnut

Black walnut dye generated some of the deepest and most naturally dimensional earth tones within the study. Using both 50% and 100% WOF concentrations on mordanted cotton and wool, the black walnut baths produced gradients ranging from warm beige and cocoa to deep chocolate brown. Unlike some natural dyes that require extensive mordanting, black walnut demonstrated strong natural adhesion properties, reinforcing its effectiveness as a sustainable dye source. The resulting Black Walnut Petal Locs crown incorporated wrapped wool yarns and sculptural loc-inspired forms that visually referenced protective styling traditions within Black hair culture. The tonal layering

achieved through varying concentrations enhanced the crown's sculptural depth while emphasizing natural texture and movement.



Figure 43. Initial attachment of black walnut-dyed wool yarns onto the wig foundation, displaying earthy brown tones produced through natural dye variation.



Figure 44. Development of sculptural looped forms using black walnut-dyed yarns, creating layered texture and dimensional movement.



Figure 45. Side and back view of the completed sculptural wig design, highlighting oversized loops and organic movement inspired by natural hair forms.



Figure 46. Model Quameya is sporting the black walnut wig, demonstrating the integration of botanical dyeing, sculptural construction, and Afrocentric design aesthetics.

Onion Skins

The onion skin dye experiments further demonstrated the accessibility and versatility of food-waste-based color systems. Both red and yellow onion skins produced warm golden, amber, and copper tones that complemented a wide range of skin tones and textures. The yarns retained curl structures effectively after rod setting, indicating that the dyed fibers could withstand manipulation while maintaining texture and shape integrity. The resulting Red/Yellow Onion Skin Bob crown highlighted the ability of natural dyes to create soft, wearable, and commercially adaptable aesthetics while still maintaining strong conceptual ties to sustainability and cultural craftsmanship.



Figure 47. Wool yarn wrapped around rods prior to heat setting, displaying tonal variation achieved through red onion skin natural dyes.



Figure 48. Curled wool yarn removed from the rods after processing, revealing textured ringlets and warm golden-orange hues produced from red onion skins.



Figure 49. Comparison of wrapped and released yarn samples, demonstrating the transformation from structured coils to soft textured curls through the dyeing and setting process.



Figure 50. Wig foundation in progress featuring red and yellow onion skin-dyed wool yarn attached to the wig cap, highlighting the early stages of curl placement, layered texture, and warm botanical color variation.



Figure 51. Completed wig constructed with red and yellow onion skin-dyed wool yarn, featuring layered curls and blended botanical color variation.



Figure 52. Model Darlene showcasing the onion skin wig design, highlighting the warm natural tones, dimensional curl patterns, and wearable sculptural aesthetic.

Collectively, the dye experiments demonstrated that botanical dyes can successfully operate as viable alternatives to synthetic dye systems within crown and wearable hair design. The results confirmed that natural dye methods can produce diverse color palettes, maintain fiber integrity, support advanced styling techniques, and contribute to emotionally affirming and culturally grounded design outcomes. Beyond aesthetics, the crowns functioned as symbols of healing, identity, and empowerment, particularly for Black women experiencing hair loss or seeking culturally relevant beauty alternatives. Ultimately, the findings support the broader goals of *Rooted in Hope* by illustrating how sustainability, Afrocentric design, material innovation, and wellness-centered fashion practices can coexist within contemporary wearable art and crown construction.

Conclusion: The Sisterhood

In conclusion, this thesis has demonstrated *Rooted in Hope*: The Botanical Crown Collection has the transformative potential of combining sustainable textile practices, Afrocentric design, wearable art, and wellness-centered innovation within contemporary fashion systems. Through the exploration of botanical dyes, sculptural crown construction, and culturally grounded storytelling, this project reimagined wigs not simply as cosmetic objects, but as crowns that embody identity, healing,

resilience, and self-expression. By utilizing natural dye sources such as turmeric, black beans, madder root, black walnut, and onion skins, the research successfully showed that plant-based color systems can produce rich, diverse, and aesthetically compelling palettes while reducing dependence on toxic synthetic dyes and petroleum-based materials. The findings revealed that wool and cotton yarns can effectively function as alternative fiber systems for wearable crowns, particularly when combined with natural dye processes and sculptural styling techniques such as wrapping, twisting, braiding, rod setting, and pin curling. The experimentation with pH modifiers and mordants further demonstrated the complexity and adaptability of botanical dyes, especially within the black bean dye studies where multiple tonal variations emerged from a single dye source. These processes reinforced the project's commitment to sustainability, material exploration, and slow fashion practices while also highlighting the emotional and cultural significance embedded within hair and adornment. Equally important, *Rooted in Hope* addressed larger social and cultural conversations surrounding Black hair, beauty standards, hair loss, and representation. For Black women experiencing alopecia, chemotherapy-related hair loss, or other forms of hair loss, the crowns offered more than aesthetic alternatives; they represented dignity, visibility, cultural affirmation, and emotional restoration. By centering Afrocentric textures, sculptural forms, and ancestral design influences, the project challenged Eurocentric beauty norms and expanded the possibilities for culturally relevant wearable design. The work of artists and designers such as Laetitia Ky, Zanele Muholi, Nick Cave, and Zsofia Kollar provided conceptual guidance by demonstrating how hair, textiles, and wearable forms can operate as vehicles for activism, storytelling, sustainability, and transformation. Their influence helped position *Rooted in Hope* within broader interdisciplinary conversations surrounding fashion, craft, performance, biomaterials, and identity-centered design.



Figure 52. Group portrait of models wearing the completed botanical crown collection, showcasing naturally dyed wool yarns created with black beans, madder root, black walnut, and turmeric through diverse sculptural forms and textures.

Ultimately, *Rooted in Hope* contributes to emerging scholarship and creative practice by bridging gaps between sustainable fashion, natural dye research, Afrocentric aesthetics, and wellness-oriented wearable systems. The project demonstrates that botanical crown design can function simultaneously as art, cultural preservation, material innovation, and holistic care. As conversations surrounding sustainability, inclusivity, and ethical fashion continue to evolve, this research proposes a future where crowns are not only environmentally responsible, but also emotionally empowering and culturally restorative. The project concludes by positioning botanical crown making as a meaningful pathway toward healing-centered design practices that honor heritage, celebrate Black identity, and cultivate more sustainable futures within fashion and wearable art.



Figure 53. “The Sisterhood” – models presenting the Botanical Crown Collection together, highlighting collaboration, cultural expression, sustainability, and the collective beauty of botanical hair-inspired textile design.

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