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# THE FIBER DYEING BY USING LOCAL NATURAL EXTRACT WITH THE BCG. CONCEPT

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## ABSTRACT

This research aims to study on extraction of natural dyes from local plants based on BCG concept as the guideline for modern textile and apparel designers to develop and apply to create textile and apparel that can respond to beauty of textile design with natural color tones and eco-friendliness. In this research, the researcher started from studying on color tones obtained from plants that could be dyed with conformity with color tones from Asian color trend used in textile design. Consequently, color tones dyed with fibers could be applied as the guideline for designers to develop their design process and creativity in other formats upon trends and fashion of each period of time. The researcher also performed all fiber dyeing procedures to obtain fibers with beautiful natural colors. All concepts and processes obtained from this research are eco-friendly and beneficial for Thailand's textile and apparel design industry that can be developed sustainably.

**Keyword :** Natural dye , Local plants , BCG

## INTRODUCTION

Development of strong community with self-reliance and sustainable advancement with national researches and innovations as well as 20-Year National strategy for building linkage in mixing technologies with local wisdom, culture, uniqueness, and integrated areas in spatial issues and spatial projects provide benefits in 4 dimensions including academic benefit, community benefit, social benefit, policy and commercial benefit. Research results and obtained knowledge could be utilized to provide the ultimate benefits to communities, society, and country. From the aforementioned strategy, development and learning on the root of Thailand's local wisdom in various dimensions is integrated with knowledge and technologies including local wisdom on dyeing from natural plants of villagers in all regions of Thailand. It is considered as another local wisdom that has been inherited and accepted for a long period as an ability in extracting natural dyes with beauty and variety from natural plants.

Natural materials and plants yielding colors are various and eco-friendly. In each natural colors dyeing, although the same type of plants is used, it may give different or similar color shades depending on ripening of plants, fruits, leaves, temperature, and seasons. This is one of charm of natural dyes. Natural colors have low fixed value referring that they may be faded easily after washing with chemicals, cleansing, or exposing to sunlight. As a result, persons who dye fibers with natural dyes must learn on dyeing methods and process based on procedures and color sealing for longer and more durable colors or dyeing techniques and the use of color controller to obtain demanded and fixed color tones but in sometime there is a feeling that natural dyed becomes more beautiful as the color transfers and fades. In the past after dyeing. (Chanoknart, 2015) Although the use of colors from natural plants is eco-friendly, there are some modern processes or procedures, like the use of chemicals for making color more durable, that may cause some pollution from dyeing procedures and reduce charm of

natural dyes. In this research, the researcher applied BCG concept as the operational guideline whereas BCG concept or concept on bio-economy, circular economy, and green economy is modern economic development to sustainable development (Thailand Textile Institute,2021). Since Thailand's textile market has the strength points on biodiversity and the use of natural materials in production of upstream, midstream, and downstream process, reduction of chemicals, energy consumption, and production costs as well as wastewater treatment become the main requirements for Thailand's textile production. In addition, standard development, reusable fashion product design, and quality development of Thailand's textile creation process will help to reduce environmental impacts and stimulate consumers to realize on environment, etc. (Thailand Textile Institute,2021) The researcher paid attention to all research procedures, especially, dyeing procedure and extraction procedure, he use of natural water sources, the use of plants, and the use of color control substance. All of them were natural without destroying or causing any environmental pollution. In addition, plant wastes from extraction and dyeing water were also made as fertilizer and water for watering plants without causing any toxicity or environmental harm. Therefore, this research can be the model of the study on natural dyeing that is eco-friendly.

Extraction of natural dyes from local plants will give a huge variety of color tones based on coloring of each type of plants. In this research, the researcher defined the guideline for studying on color tones from color trends of Asian textile of the Ministry of Commerce that has been used as the guideline for textile and apparel designers to develop their designs in various formats in the future. Studied color tones were only the samples representing basic research guideline. Benefits obtained from this research can be applied as the guideline for designers to see development forms and textile creation with natural dyeing technique from local plants. This creation also promotes learning and develops Thailand's textile industry sustainably in the future.

## **RESEARCH OBJECTIVE**

To study on extraction of natural dyes from local plants for dyeing fibers based on BCG Concept.

## **RESEARCH METHODOLOGY**

This research was conducted in the form of a creative research by studying on data obtained from documents with the aim to build knowledge on extraction of natural dyes from local plants by dyeing fibers based on BCG Concept. The researcher collected data from studying on documents and local wisdom in a community located in Pakchong District, Nakhon Ratchasima province, as well as obtaining some comments from some experts and local people. Obtained data were applied as the guideline for developing creation of extraction of natural dyes from local plants for providing benefits in artistic and cultural development and promotion of local wisdom on natural dyeing of fibers and textile. In addition, it would become the guideline for publishing thinking process on natural dyeing with eco-friendly process that was another local wisdom of Thailand which has been inherited from the past. This would be beneficial for creating interesting works and realizing on further economic development and sustainable knowledge development on Thailand's textile industry.



**Figure 1: Conceptual Framework**  
Source: Suwit Sadsunk

## RESEARCH RESULTS







### Creation Process of Natural Dyes from Local Plants based on BCG. Concept.





Natural dyeing is considered as an important process in creating beautiful colors of fibers and textile. It is the way to create aesthetic format and various usage opportunities based on preferences of consumers. Obtained textile was generated from emphasizing on selection of fibers to interesting natural dyes production process without destroying environment. Designs and colors of textile were based on beauty or demands of current market. In this research, the researcher created natural dyeing from local plants that was the guideline for mixing natural dyeing techniques with local wisdom by using materials that could be found from local sources and mixing with color tones obtained from the guideline of textile color trends, i.e., ASIA COLORS, of DITP, Ministry of Commerce (Department of International Trade promotion, Ministry of Commerce, 2022) that invented interesting and appropriate color tones with fibers and textile dyeing as the color guide for developing fashion textile or fashion lifestyle products in various designs for utilization and commercial products. For dyeing process in this research, the researcher surveyed local plants in the prototype areas in Nakhon Ratchasima province in order to extract colors by comparing color tones from color trends to find appropriate natural dyes. In addition, the researcher also studied on forms, processes, and procedures of natural dyeing based on BCG Concept whereas all processes were utilization of resources from local sources for the ultimate benefit with eco-friendliness. There must be no chemical residue from the beginning to the end of the process.



**Figure 2 :** Combination of Data on Color Tones of Natural Dyes from local plants under the Guideline on Textile Color Trends (ASIA COLORS)  
Source: DITP, Ministry of Commerce

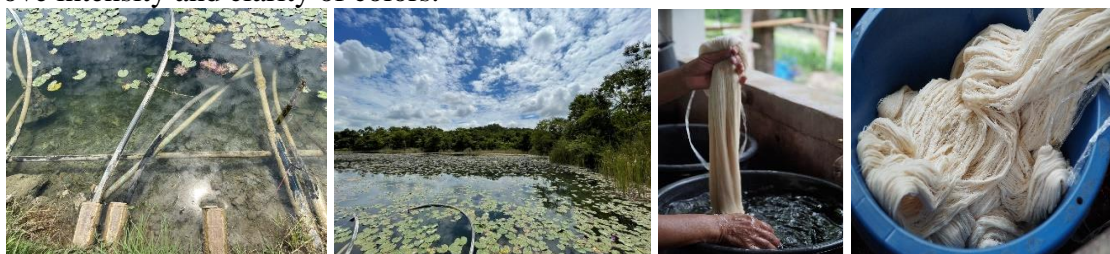
**Table1 :** Table Showing Details of Coloring and Methods of Dye Extraction from Local Plants

Types of Local plants	Form & Characteristics	Dye Extraction Process	Color Tone from Natural plants
 <p><b>Eucalyptus Leaves</b></p>	Eucalyptus is monocotyledon which its leaves grow in pairs switching with other pairs resembling sphere. Its tip is sharp with thickness and turquoise color. Its leaf stalk is short and its leaf veins can be seen clearly. Its length is around 2 centimeters.	To extract dye, its leaves must be boiled and filtered with filter cloth.	 <p>Color tone : Ivory, Creamy white and Soft cream</p>
 <p><b>Purple Cabbage</b></p>	Its appearance is the same as that of general cabbage but its leaf color is red or reddish purple. Its stem is short with simple leaves overlaying one another. Its leaves are thick with red color covered with white cream film. Its head is round or quite round depending on each ecotype.	To extract dye, it was sliced to separate its leaves or sliced into pieces before boiling and filtering with filter cloth.	 <p>Color tone : Glaucous, Sage and Light mint green</p>
 <p><b>Annatto Tree</b></p>	Annatto tree's seed is coated with hard shell of its triangle fruit with sharp tip, tangerine color and hair around its fruit. When it is ripen, its fruit will break showing its seeds inside in the form of a large number of small and round seeds with red-brown color.	To extract dye, its seeds must be ground or pounded into powder before boiling and filtering with filter cloth.	 <p>Color tone : Soft yellow, Dark yellow and Saffron</p>

Types of Local plants	Form & Characteristics	Dye Extraction Process	Color Tone from Natural plants
 <p><b>Sappan Tree's Core + Turmeric</b></p>	<p>Sappan tree is classified as shrub or small perennial plant whereas its stem and branches have small, curve, and hard thorn. For Caesalpiniacear, its core has dark red color whereas core of Caesalpinia Sappen L. has dark yellow color. Turmeric is classified as annual crop with underground rhizome. Its color is ranged from yellow to dark yellow with unique smell.</p>	<p>To extract dye, sappan Tree's core was boiled with water to obtain red or dark red color before mixing with dye extracted from turmeric by grinding turmeric's rhizome to obtain yellow color.</p>	 <p>Color tone : Dark red, Dark red-orange and Reddish brown</p>
 <p><b>Jambolan Plum</b></p>	<p>Its ripen fruit has oval shape and grows in the manner of bunch with dark violet color and black color. Its fruit is sweet and sour or acidulous.</p>	<p>To extract dye, its seeds must be ground or pounded into powder before boiling and filtering with filter cloth.</p>	 <p>Color tone : Coral, Orange-pink and Light ash brown</p>

### Natural Fiber Dyeing with Natural Dyes from Local Plants Based on BCG. Concept.

1. To prepare and clean fibers, water from natural water sources in nearby areas was used for cleaning and dyeing because it helped to improve dyeing properties to obtain beauty and clarity without any residue. From observation, local wisdom of villagers on comparison between tap water and natural water in dyeing could represent that natural water helped to improve intensity and clarity of colors.



**Figure 3 :** Natural Water Sources, Fiber Cleaning, Soaking Fibers in Ash Water before Dyeing.  
Source: Suwit Sadsunk

2. To prepare mordant, since this kind of method is considered as local wisdom, Tannin that could be found in nature, like Eucalyptus peel water, Paduak peel water, guava leaves water, alkali water or ash water from softwood plants, and mud, etc., was prepared as mordant for obtaining durable colors. These kinds of water were extracted to obtain acidulous water before soaking fibers or textile in such water before dyeing. In this research, the researcher used ash water from wastes of natural plants and barks from fueling used in boiling dyeing



water. Therefore, everything used in this dyeing process would be utilized for this operation as much as possible.

3. To use local plants for extracting dyes based on knowledge of senior people that has been inherited as local wisdom of the community, local plants, like Jambolan Plum, purple cabbage, Eucalyptus leaves, Annatto Tree, turmeric, and Sappan Tree, etc., were used for dyeing through villagers' methods without using any chemical or diluted substance leaving any residue in dyeing water. Extraction of dyes could be performed by grinding and pounding seeds, barks, leaves, and stems or boiling them until color water was obtained. Subsequently, obtained water was filtered and cooling. Fibers or fabric would be prepared for dyeing. These local plants yielded charismatic colors with uniqueness of color tones of those local plants. In this procedure, to obtain modern colors that could be developed in the light of commercial production process for various designs of products, the researcher selected color tones from local plants that could be compared with trendy and modern color shades as suggested by textile color trends (ASIA COLORS) of DITP, Ministry of Commerce (Department of International Trade promotion, Ministry of Commerce, 2022) in order to obtain demanded dyeing color tones that could be developed further for commercial purposes and exportation in higher production level. Besides emphasizing on plants used in dyeing, the researcher also considered on processed based on BCG Concept regarding wasted dyeing water. Since these colors were extracted from natural plants, there was no residue. Consequently, wasted water from this dyeing could be used for watering plants or releasing back to nature. In addition, wasted barks could be made as fertilizer used in growing alternative crops that was another way to truly represent sustainability in the form of local resources and materials management process.



**Figure 4 :** Natural Color Tones from Local Plants and Fiber Dyeing Process  
Source: Suwit Sadsunk

## CONCLUSION

This research was conducted to study on Fiber Dyeing from Extraction of Natural Dyes from Local Plants Based on BCG Concept which helped to create research process on natural dyes from local plants in the areas of Nakhon Ratchasima province for dyeing through local wisdom and eco-friendliness in all processes based on BCG concept. This would be beneficial as the guideline for modern designers of textile and apparel industry to find the way to apply

local wisdom on natural dyeing worthily and creatively. In this research, the researcher defined that selection of dyes must be based on the guideline on Asian textile color trends of the Ministry of Commerce. Subsequently, local plants were selected to obtain demanded colors therefore color tones dyed with fibers could be applied as the guideline for designers to develop their design process and creativity in other formats upon trends and fashion of each period of time. Studied and extracted color tones consisted of: ivory, creamy white, and soft cream color tone from extraction of dyes from eucalyptus leaves; glaucous, sage, and light mint green color tone from extraction of dyes from purple cabbage; soft yellow, dark yellow, and saffron color tone from extraction of dyes from Annatto Tree; dark red, dark red-orange, and reddish brown color tone from extraction of dyes from Sappan Tree mixed with turmeric water; and coral, orange-pink, and light ash brown from extraction of dyes from Jambolan Plum. When comparing to Asian textile color trends, the results of natural dyeing from local plants were similar with those color shades. In addition, they were also considered as interesting and beautiful color tones that could be applied to develop design works, textile and other types of apparel. From such guidelines and operational processes, they could be developed further to drive Thailand's apparel industry through local wisdom integrated with modern technologies for sustainable development.

## DISSCUSSION

In this research, the researcher studied on dyeing color tones based on Asian textile color trends of the Ministry of Commerce to define color tones of local plants for extraction therefore color tones dyed with fibers could be applied as the guideline for designers to develop their design process and creativity in other formats upon trends and fashion of each period of time.

Tuenta Pornmutawarong and Siratcha Samleethong, 2022., who studied on the Guideline for Developing Woven Fabric Dyed with natural Dyes from all Community Cultures to Enhance Income and Self-Reliance of Kiri Wongkot Village in Udon Thani Province, Suan Sunandha Rajabhat University, mentioned the issue that was consistent with the use of local plants to extract dyes of fabric and textile through local wisdom and cultural capitals of Kiri WongKot Community. However, dyeing and design development of such work was only the research guideline using existing community's ideas without utilizing values or color trends that could respond to all demands of all groups of people in society and the market of textile industry in commercial dimension for linking with the trend of fashion products and textile purchasing. As a result, the researcher developed such research results further by using Asian textile color trends of the Ministry of Commerce to determine color shades used for dyeing fibers. Consequently, obtained dyes could be used as the guideline for utilization and design that could respond to demands and commercial preferences more completely.

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