Volume 5, Issue 4, 2022 ISSN: 2617-9938
DOI: https://doi.org/10.31058/j.ad.2022.54003

Development and Inheritance of The Traditional Plants Dyeing Technology Combined With Children's Clothing in The Digital Medium Age

Huanhuan Jin[1,2*]

[1] International College, Krirk University, Bangkok, Thailand
[2] School of Mechatronic Engineering, Jiangsu Normal University, Xuzhou, China

Email Address

843372865@qq.com (Huanhuan Jin)
*Correspondence: 843372865@qq.com

Received: 6 June 2022**; Accepted:** 30 June 2022**; Published:** 4 August 2022

Abstract:

Plant dyeing is a traditional dyeing technology that has been inherited for thousands of years in China. The clothes dyed by the plant dyeing technology have rich and bright colors, and are green and beneficial to human health. Under the background of the "double carbon" goal and the continuous improvement of people's living level, plant dyeing has become an important development direction of the ecological garment with its own unique advantages. Infants and young children have very delicate skin and weak resistance to illness, and their clothes are paid more attention to health. Thereby, the combination of plant dyeing with children's clothing is a win-win situation for both market consumption and cultural development. Today's digital media technology has the advantages of fast spread speed and high public acceptance. In this paper, it was discussed that plant dyed children's clothing can be sold through online channels in the aid of media digital technology. At the same time, plant dyeing culture can be introduced in the selling advertising space, so that consumers can understand the traditional culture of plant dyeing by purchasing and wearing the green plant dyed clothes. Therefore, more opportunities for the promotion, inheritance and development of traditional plant dyeing art in china can be created.

Keywords:

Plant Dyeing, Children's Clothing, Ecological Garment, Digital Medium, Inheritance

1. Introduction

The development of Chinese traditional plant dyeing art has a broad and far-reaching history. It is the crystallization of the intelligence and art of the labouring people and the essence of Chinese traditional folk dyeing technology in ancient China [1]. However, with the changes of history and culture and especially suffering the impact of the market economy after the reform and opening up, the traditional plant dyeing technology has been getting farther from people. The digital transformation process of the New York Times shows that media digitalization is the combination of

high-quality content and new technologies. Media digitalization will create a content that is more in line with the law of internet value, and establishes a business model that connects today's excellence and tomorrow's potential [2]. It is the result of scientific progress and the symbol of the development of social civilization. It can bring new opportunities for the inheritance and development of Chinese traditional plant dyeing culture. In recent years, with the accelerating pace of people's work and life, more and more people are eager to return to the nature and pursue a simple life. Therefore, the plant dyeing technology has become an important direction for the development of ecological clothing design. Plant dyeing technology can be innovatively employed in the application of children's clothing due to the broad market and unique appeal. At the same time, the publicity of plant dyeing in the network environment can be obviously expanded through taking children's clothing as the media, which has a strong demonstration and practical significance for inheritance and development the art of plant dyeing, with fully utilizing the digital media technology with internet.

2. Characteristics of Plant Dyeing

Fabrics are dyed by the dyes which are extracted from plants such as flowers, grass, trees, stems, leaves, fruits, seeds, skins, roots, etc. in plant dyeing technology. Common natural dyes include onion skin, peanut skin, pomegranate skin, grape skin, tea, sophora japonica, rose, gardenia, safflower, and so on. The dyes are also known as healthy dye that can be even drunk because they are green, safe, healthy and environmentally friendly. Through plant dyeing, not only bright colors with high brightness but also delicate and soft intermediate colors can be obtained. With the repetitious dyeing of the same charms and the over dyeing of different charms, more layered colors can be produced. It is usually easy to acquire the various kinds of natural dyes in nature. Different colors can be received by different dyes contained in different plants. The colors of plant dyeing mainly contain red, blue, green, brown, yellow, purple, etc. The fabrics dyed by plants have a natural and elegant color, a good compatibility with the environment and biological degradation ability which the fabrics dyed by the chemical dyeing does not possess. The residue and waste of plant dyeing materials can be properly treated to produce pollution-free fertilizer for agricultural production. The fabrics dyed by Chinese herbal medicine also have medicinal value. Some researches reveal that the medicinal effective ingredients together with natural pigment components of some Chinese herbal natural dyes are absorbed by the fabric during the dyeing process, so that the dyed fabric has special antibacterial, anti-ultraviolet and insect-proof functions. For example, the Escherichia coli inhibition rate of fabrics dyed by pomegranate skin can reach 100%, and the antibacterial rate of wool fabric dyed by turmeric can still get to 80% after 30 times washing. The fabrics dyed by rubia, indigo, rhubarb, and shikonin have good protection against ultraviolet rays [3,4].

However, the plant dyeing process also has some limitations. Firstly, color system of plant dyeing is not comprehensive compared with chemical dyeing. Moreover, the components of natural plant dyes are very complex. Even for the same plant dye with different climate, origin and picking time, its content, composition, color and concentration will be different, resulting in differences in dyeing and poor reproducibility. Moreover, because of the low content of pigments in plants, a large number of plant raw materials are required; some plants are both dyes and Chinese herbal medicines which have high economic value, together with plant dyeing process

being more complex, which attributes to high dyeing costs. Besides, plant dyeing has special requirements for fabric selection. Generally, it is only applicable to the natural yarn and fabrics such as cotton, hemp, silk, wool, bamboo fiber and protein fiber. The dyeing rate of chemical fiber and synthetic fiber is low, and the color fastness is unstable [5,6].

3. The Development Path of Plant Dyeing in Children's Clothing

The inheritance and development of traditional plant dyeing in modern society need to make the best of its special advantages and combine it with the new digital media technology widely spreading in the current society. It is necessary to connect plant dyeing technology with the social development trend and the consumer market. The needs of children's clothing are well matched with the characteristics of plant dyeing. Thereby, it will have a broad prospect to integrate plant dyeing into the children's clothing market and develop high-end plant dyed children's clothing brands. Meanwhile, a good cultural inheritance effect will be generated by the extension of social influence of plant dyeing through taking the children's clothing as a medium. In terms of the limitations of plant dyeing, we can continuously develop new plant dyes and improve pigment extraction and dyeing process, promoting the extended application of this technology in modern clothing.

3.1. Developing High-End Plant Dyed Children's Clothing Market

In the current children's clothing market, chemical dyes are mainly used in the dyeing and finishing process. There are some quality problems such as unqualified decomposable carcinogenic aromatic amine dyes and pH value and excessive formaldehyde which do not meet the standards of "the National general safety technical code for textiles of China". Random inspection results of the quality of infants and young children's clothing products conducted by market supervision and administration of Guangdong province in 2017-2020 are listed in Table 1. It can be found that the harmful substances from chemical dyes exceed the standard in children's clothing every year. At present, the contradiction between the increasing social environmental pollution and the continuous improvement of people's life quality has become prominent. Green, healthy and safe plant dyeing has reentered people's vision and gained more and more attention. In particular, children have delicate skin and poor immunity, and thus children's clothing should be paid more attention to health. The plant dyeing process is relatively complex, with high time and economic cost, poor color reproducibility and uniqueness of most of the patterns. Hence, it is difficult for the plant dyed children's clothing to be a mass- production in the market. However, we can make full use of the advantages of plant dyeing with the unique patterns, soft and natural colors, antibacterial, anti ultraviolet, sedative pharmacological value, health and environmental protection to develop a small number of privately customer-made high-end clothing which can effectively protect children's delicate skin and avoid the problems of irritation and allergy commonly caused by chemical dyes. On the other hand, plant dyeing has poor color reproduction and it is uneasy to copy patterns, which can just meet some consumers' aesthetic psychology with pursuing uniqueness, individuality and high quality, achieving a win-win situation between consumers and producers. Nowadays, there are a few brands that have applied the plant dyeing technology to children's clothing in china, such as a children's clothing brand named Yuanzhen in Ningbo city and its representative children's outer garment is shown in Figure 1. The original meaning of the brand

name is derived from nature and restored to the true state. On one hand, it means that the fabric is dyed by plants, which is natural and environmentally friendly, providing healthy and organic clothes for children and conveying the healthy and low-carbon life conception; On the other hand, Yuanzhen brand has unique views on life and good aesthetic taste. It advocates a natural, free, comfortable and healthy lifestyle and represents a kind of life aesthetic attitude with restoring the original truth. The brand independently designs and produces new products. It not only strives for innovation and changes in style but also continuously innovates in fabric, and pursues the unity of product functionality and sensory aesthetics.

Figure 1. *Representative picture of infant's apparel from Yuanzhen brand.*

Table 1. *Random inspection results of clothing for infants and young children conducted by market supervision and administration of Guangdong province in 2017-2020.*

Year	Unqualified items				
	PH value (pcs)	**Formaldehyde (pcs)**	**Decomposable carcinogenic aromatic amine dyes (pcs)**	**Color fastness (pcs)**	**Heavy metal (pcs)**
2020	8	1	Existing, specific number unknown	10	1
2019	9	1	0	13	3
2018	14	3	4	19	1
2017	15	3	0	21	1

3.2. Developing of New Dyes and Processes

The traditional way to obtain dye liquor of plant dyeing is relatively single, which cannot meet the current market demand for batch production. In order to satisfy the social needs of today' market economy and sustainable development, the plant dyeing process has to be improved with the aid of the modern advanced science and technology. At first, we can start with raw materials and use the plant transgenic technology to develop and cultivate new plant dyes with high pigment content so as to resolve the problem of excessive demand of expensive raw materials. Furthermore, it is obligatory to develop and modify the plant dyeing process such as solvent extraction, enzyme assisted extraction, ultrasonic assisted method, freeze-drying method, supercritical CO_2 extraction method, fiber modified dyeing method, etc. [7,8,9]. Meanwhile, the plant dyeing process should be continuously optimized to increase dyeing efficiency and dyeing performance as well as realize the real zero pollution. A special organization has been set up to study plant dyeing and a series of textiles dyed by plant dyeing have been developed in Japan. Murata Dyeing Co., Ltd., Luodong Chemical Industry Co., Ltd (Dajin city) and Jingdu Industrial Technology Research Institute jointly developed industrialized batch production technology for plant dyeing. This technology uses plant raw materials such as sapphire, cochineal, pomegranate, etc. The products have 12 colors including vermilion, pink, tawny, red, purple, etc. Except for the light color system, the intermediate color system and dark color system have been also introduced to different customers' needs. Although the

cost of the plant dyed products is 3-4 times than that dyed by chemical dyeing, it is continuously admired by well-known brands and designers because it conforms to the trend of advocating nature.

4. Inheritance of Plant Dyeing Technology Through Children's Clothing in the Era of Network Media

Inheritance is not a copy of traditional culture but an innovative and developed inheritance combined with the development of the times. In the digital media era, plant dyeing process can be related with children's clothing in order to protect and inherit this intangible cultural heritage, which complies with the requirement of environmental protection and the parents' expectations for the healthy growth of their children.

4.1. Current Situation of Chinese Children's Clothing Dyed by Plant Dyeing

Presently, the public lacks a basic understanding for plant dyeing. For the development and inheritance of this technology, the propagation should be enhanced and it needs to be associated with the market. There are very few brands of plant dyed children's clothing. The products lack variety and consist largely of children's T-shirts. Based on the investigation in internet, there are two representative kinds of plant dyed children's clothing brands in TaoBao.com. One is La De Shi Jie from Hunan province of China. The children's clothing is single in color, mainly based on indigo dyeing. The patterns of the product are traditional and lack a fashion sense so the sales are sluggish. Another brand is Gap, a well-known American clothing brand with the concept of development and innovation. The products have a fashionable, concise, generous and casual style so that naive and lively children can enjoy a natural and comfortable life. The fabric is made of pure cotton which is breathable, skin friendly and suitable for plant dyeing. The clothes style is simple and generous with adopting three-dimensional cutting and tie dyeing, which conforms to children's body shape, sports needs and aesthetics. Thus, the brand has been widely accepted by the parents and children. Table 2 shows that for the sales of plant dyed children's clothing in spring and summer of 2021. It can be seen that the fabrics of plant dyed children's clothing in the market are mainly pure cotton with a tie dyeing process predominating. The prices are higher than similar chemical dyed products by 60%. In general, the market sales are gradually increasing and customer satisfaction is high.

Table 2. *Sales of plant dyed children's clothing in spring and autumn of 2021.*

Brand	Style	Printing process	Fabric	Tag price (¥: Yuan)	Monthly sales (pcs)	Customers' comments
GAP		Tied dyeing	Pure cotton	199	51	138 items; Nice to match with other clothes, comfortable, beautiful, and children like it.
GAP		Tied dyeing	Pure cotton	179	21	18 items; comfortable, beautiful, and high quality.

GAP		Tied dyeing & printing	Pure cotton	129	14	269 items; comfortable, good fabric, style and quality.
GAP		Folder stained	Pure cotton	129	5	14 items; good quality.
GAP		Tied dyeing	Pure cotton	69	76	89 items; beautiful, comfortable, breathable, good quality but a little chromatic difference.
GAP		Tied dyeing	Pure cotton	119	4	27 items; beautiful and good quality.
GAP		Tied dyeing	Pure cotton	199	10	18 items; Soft fabric, fresh color and good quality.
La De Shi Jie		Tied dyeing	Pure cotton	129	1	Null
La De Shi Jie		Tied dyeing & Stencil Dyeing	Pure cotton	199	0	Null
La De Shi Jie		Tied dyeing & lace-merging	Pure cotton	129	0	Null

4.2. Inheritance of Plant Dyeing Through Children's Clothing

Digital media has a fast propagation speed and is widely acceptable by people. Therefore, the creative design of plant dyed product should be carried out with the combination the popular characteristic of contemporary children's clothing [10]. It is necessary to continuously make breakthroughs of stably industrialized small batch production technology for plant dyeing. Hence, high-end and sufficient plant dyeing children' clothing will be produced. In the meantime it is sensible to make the most of the huge digital flow of the internet to sell plant dyed children's clothing through Tiktok, xiaohongshu, tmall, Taobao, JD and other main-stream media websites. In sales, the exquisite video can be made for every piece of plant dyed clothing, containing the content which fuses the history, characteristics, functions and advantages of plant dyeing with the aesthetic details of children's clothing. The video should be placed at the eye-catching position of the product details page for

consumers to fully understand the characteristics and value of plant dyed children's clothing. Further, the details of plant dyed children's clothing should be illustrated with pictures and texts to expand the influence of plant dyed clothing products in the public and thus more consumers know and accept this environmental friendly and healthy traditional process. Children can feel the charm of traditional plant dyeing with wearing plant dyed clothes and their awareness of environmental protection and carrying forward traditional culture can be cultivated since childhood, which has both good economic benefits and certain practical educational significance.

It can be seen from the good sales cases of gap brand that people can have a better understanding of the plant dyeing through the plant dyed children's clothing market in the digital media network sales environment. More and more parents gradually accept and are willing to buy plant dyed children's clothing owning to its beauty, comfort, novel style and good quality. Both new business opportunities for the children's clothing market and a new direction for the inheritance of excellent plant dyeing culture have been opened. In summary, the integration of plant dyed children's clothing and network digital media technology is not only a practical way to express the aesthetic thought of plant dyeing but also a good way to inherit and develop the traditional plant dyeing art.

5. Conclusions

With the gradual improvement of people's awareness of environmental protection and health, plant dyeing has entered people's vision again with its unique advantages of health, greenness and medicinal efficacy. However, due to the limitations of high price, incomplete color system and selectivity for dyed fabrics, plant dyeing is less applied in the textiles and clothing industry at present and consequently people has insufficient awareness of plant dyeing. In the new era, it is essential to employ the plant dyeing into children's clothing with the characteristics of short wearing time, high health needs, comfort and beauty. With the innovation design of children's clothing and tackling key problems of modern plant dyeing process, high-end and various plant dyed children's clothing can be produced. It is significant to introduce the digital online mall with an extensive participation by people to sell the plant dyed products and publicize the plant dyeing, which can improve the added value of children's clothing as well as meet the public's demand for green and healthy clothing. There will be a new direction and broader space for the inheritance and development of plant dyeing art through the plant dyed children's clothing.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

References

[1] Tang, F. Elementary introduction to traditional Chinese plant dyeing art and its inheritance in modern times. Design, User Experience, and Usability: Designing Interactions, 7th International Conference, DUXU 2018; pp. 96-109.

[2] Ci, C.M.; Ren, J. Research on clothing brand promotion based on network media. Textile Bioengineering and Informatics Symposium Proceedings 2017-10th Textile Bioengineering and Informatics Symposium, TBIS 2017; pp. 577-585.

[3] Yan, X.; Hong, L.; Pei, S.H.; Hamilton, A.; Sun, H.; Yang, R.; Liu, A.; Yang, L. A natural yellow colorant from Buddleja officinalis for dyeing hemp fabric. *Industrial Crops & Products,* 2021, 171, 113968.

[4] Liu, Z.; Khan, T.A.; Islam, M.A.; Tabrez, U. A review on the treatment of dyes in printing and dyeing wastewater by plant biomass carbon. *Bioresource Technology,* 2022, 354, 127-168.

[5] Dong, F.; Zhu, X.; Jia, Y. Research on plant indigo dyeing the silk fabrics. *Advanced Materials Research,* 2011, 175-176, 703-706.

[6] Rejo, A.; Adhiguna, R.T.; Rajagukguk, D.G. Study of natural dyes and pineapple leaf fibres growing locations within plant stems on dyeing intensity. *E3S Web of Conferences,* 2018, 68, 01030.

[7] Lo, Ch.H. Degumming silk by CO_2 supercritical fluid and their dyeing ability with plant indigo. *International Journal of Clothing Science and Technology,* 2021, 33(3), 465-476.

[8] Dhouibi, N.; Baaka, N.; Charradi, R.; Bouine, I.; Dhaouadi, H.; Dridi-Dhaouadi, S. Multi-fiber dyeing improvement using natural supercritical CO_2 extracts. *Fibers and Polymers,* 2021, 22(7), 1874-1882.

[9] Kovačević, Z.; Sutlović, A.; Matin, A.; Bischof, S. Natural Dyeing of Cellulose and Protein Fibers with the Flower Extract of Spartium junceum L. Plant. *Materials,* 2021, 14, 4091.

[10] Peng, L.; Dong, C.H. Study of the Locals Innovative Costume Design in Hsiang-Bi Tribe. Proceedings of the 2017 IEEE International Conference on Applied System Innovation: Applied System Innovation for Modern Technology, ICASI 2017; pp. 192-194.