



Quality Testing of *Iretsu* Dyeing Result on *Primissima* Cotton and Chiffon Fabrics Using Water Glass as a Fixator

Meishinta Alvionita Junia Mirantika and Adhi Kusumastuti*

Fashion Education Study Program, Faculty of Engineering, Universitas Negeri Semarang

*Corresponding author: adhi_kusumastuti@mail.unnes.ac.id

ABSTRACT - Textiles are essential clothing needs for humans and are inseparable from the dyeing process as a determinant of aesthetic value. Textile dyeing generally uses natural and synthetic dyes, with synthetic dyes being more widely used due to their availability, efficiency, and applicability to various types of fabrics. However, certain synthetic dyes are typically intended for specific fabric types, such as *Iretsu* dye, which is commonly used for polyester fabrics. This study aims to examine the application of synthetic *Iretsu* dye on two types of fabrics, namely *Primissima* cotton and chiffon, using two dye formulations of 12 g and 24 g with the same dyeing duration. The research employed an experimental method through a dyeing process lasting 1 hour using water glass as a fixing agent. The dyeing results were evaluated through organoleptic testing on the aspect of color direction by trained panelists, namely students of the Fashion Education Program, Class of 2022, Universitas Negeri Semarang, who had completed the Textile Dyeing Techniques course. The results showed that *Primissima* cotton produced a pewter color direction (50%) at the 12 g formulation and porpoise (55%) at the 24 g formulation, while chiffon fabric produced a flint color direction at both formulations, with a higher dominance percentage at the 24 g formulation. This study is expected to contribute to the development of textile dyeing techniques, particularly in expanding the application of synthetic *Iretsu* dye to non-polyester fabrics, and to serve as a basis for further research on color quality and color fastness across a wider range of fabrics and dye formulations.

Keywords: *Iretsu*, *Primissima* cotton, chiffon, water glass, color direction, organoleptic test.

INTRODUCTION

Textiles play a vital role in fulfilling human clothing needs and are therefore inseparable from daily life (Wahyu et al., 2023). As aesthetic value is a key attribute of textile products, dyeing processes are an integral part of textile production. The application of dyes has consequently attracted significant interest among textile artisans and manufacturers. Generally, dyes are classified into two main categories, natural dyes and synthetic dyes (Hapsari Kusumawardani et al., 2021). Natural dyes are derived from natural sources, including plants and animals, such as lac dyes. In contrast, synthetic dyes are more commonly employed in the textile industry due to their practical advantages. However, many synthetic dyes may contain heavy metals. The presence of heavy metals in synthetic dyes arises from the incorporation of metallic elements in certain dye compounds, as well as the use of metals as catalysts during the dye manufacturing process (Satria & Suheryanto, 2016). Various types of synthetic dyes are utilized in textile dyeing processes, including naphthol, remazol, indigosol, rapide, *Iretsu*, and others.

Natural dyes are inherently more environmentally friendly because they are derived from renewable resources, in contrast to synthetic dyes, which originate from non-renewable petroleum-based resources. However, the limited availability of natural dyes in large quantities, particularly with consistent and guaranteed quality, has led many practitioners to prefer synthetic dyes, which are more diverse and readily accessible. In addition, synthetic dyes are widely selected due to their shorter processing time and more efficient dyeing procedures compared to natural dyes.

Synthetic dyes are widely used in textile dyeing processes because they can be applied to a broad range of fabric types. However, certain dyes are specifically designed for particular fabrics, such as naphthol dyes, which are commonly used for cotton fabrics, and remazol and *Iretsu* dyes, which are frequently applied to polyester-based textiles. In textile dyeing processes, a pre-mordant treatment is typically employed as an initial fabric preparation to enhance dye absorption (Ningtarich et al., 2025). In this study, alum was used as the mordant. Alum is a naturally occurring mineral compound in the form of white crystals that functions as an antiseptic and astringent (Ahmad & Hidayati, 2020). In addition to pre-mordant treatment, a color fixation process is required to lock the dye after the dyeing stage (Anbarwati et al., 2025). The fixative used in this study was water glass. Water glass is a viscous, clear to yellowish liquid that is soluble in water (Fadhila et al., 2022).

Previous research by Cahyadi et al., (2024) examined the use of *Iretsu* and dylon dyes on several polyester fabrics however, the study was limited to polyester materials. Therefore a research gap remains regarding the application of synthetic *Iretsu* dye on non-polyester fabrics, particularly *Primissima* cotton and chiffon. In addition, studies on the effect of dye formulation variations combined with alum pre-mordant and water glass fixation on color direction are still limited. This study aims to analyze the color direction of *Primissima* cotton and chiffon dyed with synthetic *Iretsu* using different dye formulations through organoleptic testing. The findings are expected to contribute to the development of textile dyeing techniques and support the broader application of *Iretsu* dye in non-polyester fabrics for educational and industrial purposes.

METHOD

This study employed an experimental research method. Experimental research is a comprehensive quantitative research approach, as it fulfills all requirements for examining cause and effect relationships (Arif Rachman, Yochanan, 2024). The experimental method used in this study was a descriptive experimental design, which combines experimental procedures with a descriptive approach by applying treatments or manipulating specific variables and then describing the results (Sari et al., 2023). The method involved dyeing *Primissima* cotton and chiffon fabrics using two different dye formulations with the same dyeing duration. The two formulations consisted of 12 g and 24 g of dye, with a dyeing time of 1 hour, followed by the use of water glass as a color fixing agent. This experiment examined the color direction resulting from the dyeing of *Primissima* cotton and chiffon fabrics. The research was conducted at the Faculty of Engineering, Universitas Negeri Semarang. The population refers to the general collection of objects that have specific characteristics to be studied and from which conclusions can be drawn (Candra Susanto et al., 2024). Meanwhile, the sample is a subset of the population representing part of its characteristics (Mushofa et al., 2024).

Based on the panelists, color direction testing can be conducted to determine the visual tendency of colors resulting from the textile dyeing process, such as tendencies toward reddish, yellowish, bluish, or greenish hues (Simanungkalit & Syamwil, 2020). This study employed an organoleptic test, which is an evaluation method that uses the human senses to assess the quality or characteristics of a product (Astuti, 2022). The assessment was carried out through visual sensory evaluation using trained panelists. The panelists involved were students who had completed the Textile Dyeing Techniques course, thus possessing basic knowledge of color theory, textile color systems, and experience in observing and distinguishing color direction. The criteria for panelists included: (1) having passed the Textile Dyeing Techniques course, (2) having no color vision deficiencies (color blindness), and (3) being willing to participate in the entire testing process.

The dyed fabric samples were conditioned under standardized lighting conditions using a white light (daylight) source and observed in a room with uniform light intensity. Each panelist was asked to evaluate the samples individually and determine the dominant color direction by comparing them with predefined reference colors or color descriptors. The assessment was conducted using an evaluation sheet that provided simplified color direction categories to ensure clarity and consistency among panelists.

The panelists' evaluation data were analyzed using descriptive quantitative analysis by calculating the frequency and percentage of the observed color direction tendencies (Masnidar, 2017). The color direction with the highest percentage was determined as the dominant color direction of the tested sample, which was formulated as follows :

$$P = \frac{n}{N} \times 100 \%$$

Description :

- P : The calculated percentage value
- n : The obtained score (frequency of responses)
- N : The total number of panelists

The research flow represents a sequence of steps designed to conduct the study in a structured and systematic manner (Ruhansih, 2017). The research flow applied in this study is as follows:

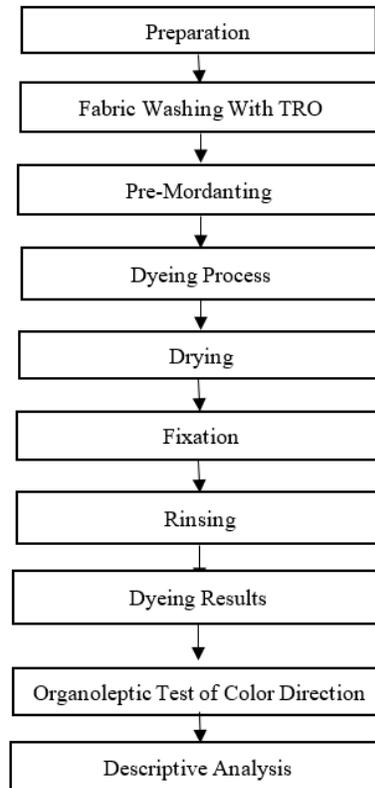


FIGURE 1. Research Flow

The preparation stage involved the selection and preparation of the tools and materials used in the study. The materials included *Primissima* cotton fabric, chiffon fabric, alum, soda ash, salt, *Iretsu* dye, TRO, and water. The equipment used consisted of a digital scale, containers, a stove, and brushes. The implementation stage comprised fabric washing, mordanting, dyeing, drying, color fixation, and rinsing. Fabric washing was carried out using water mixed with TRO powder, followed by rinsing and air drying. The mordanting process was conducted by boiling the fabrics in a solution containing 10 g of alum, 3 g of soda ash, and 2.5 L of water. All materials were mixed and boiled for 30 minutes, after which the fabrics were soaked overnight. The dyeing stage was performed using two dye formulations, namely 12 g/L and 24 g/L. The fabrics were immersed in the dye solution for 1 hour. After dyeing, the fabrics were air-dried. The color fixation stage was carried out by applying a formulated water glass solution to the dried fabrics, followed by repeated air drying. The rinsing stage was conducted after the fabrics had completely dried following fixation and consisted of two steps. The first rinsing used clean water, followed by air drying, and the second washing was performed using soap. The final stage involved evaluating the dyeing results in terms of color direction using an organoleptic test.

RESULTS AND DISCUSSION

Result

This study discusses the quality of dyeing results using *Iretsu* dye. An experimental approach was conducted using two different types of fabrics for comparison, namely chiffon, which is classified as a polyester fabric, and *Primissima* cotton fabric. In addition, two dye formulations, 12 g and 24 g, were applied to examine the resulting color direction

on both fabrics. Water glass was used as the color fixative. The aspect evaluated in this study was the organoleptic assessment of color direction. The results of the organoleptic test along with the descriptive analysis are presented below.

TABLE 1. Dyeing results.

<i>Iretsu</i> Dye Formulation	<i>Primissima</i> Cotton	Chiffon
12 g		
24 g		

The color direction test was conducted by comparing the colors obtained from the dyeing process with a color catalog. The results of the organoleptic test involving 20 students from the Fashion Education Study Program, Universitas Negeri Semarang, Class of 2022, showed the following color direction outcomes:

Based on the results obtained from the observation sheets, it can be concluded that the color direction outcomes were as follows. For *Primissima* cotton fabric dyed with the 12 g color formulation, 10 panelists selected pewter (50%), 4 selected flint (20%), 3 selected porpoise (15%), and 3 selected dove (15%). For chiffon fabric dyed with the 12 g formulation, 10 panelists selected flint (50%), 5 selected coin (25%), and 5 selected silver (25%). For *Primissima* cotton fabric dyed with the 24 g formulation, 7 panelists selected pewter (35%), 11 selected porpoise (55%), 1 selected smoke (5%), and 1 selected graphite (5%). For chiffon fabric dyed with the 24 g formulation, 14 panelists selected flint (70%), 2 selected pewter (10%), 1 selected silver (5%), and 3 selected coin (15%).

TABLE 2. Organoleptic evaluation results.

<i>Primissima</i> Cotton 12 g	Color Direction			
	grey	shadow	graphite	iron
	pewter	cloud	silver	smoke
	slate	anchor	ash	porpoise
	dove	fog	flint	charcoal
	pebble	lead	coin	fossil

Chiffon 12 g

Color Direction



grey	shadow	graphite	iron
pewter	cloud	silver	smoke
slate	anchor	ash	porpoise
dove	fog	flint	charcoal
pebble	lead	coin	fossil

Primissima Cotton 24 g

Color Direction



grey	shadow	graphite	iron
pewter	cloud	silver	smoke
slate	anchor	ash	porpoise
dove	fog	flint	charcoal
pebble	lead	coin	fossil

Chiffon 24 g

Color Direction



grey	shadow	graphite	iron
pewter	cloud	silver	smoke
slate	anchor	ash	porpoise
dove	fog	flint	charcoal
pebble	lead	coin	fossil

Discussion

This study analyzes the color direction of *Primissima* cotton and chiffon fabrics dyed using synthetic *Iretsu* dye with water glass as a fixing agent, based on organoleptic test results analyzed descriptively. Color direction is influenced by dye formulation, fiber characteristics, fabric structure, and the interaction between the dye and the fixing agent. *Primissima* cotton fabric dyed with the 12 g formulation produced a pewter color direction 50%, while the 24 g formulation showed a shift toward a porpoise color direction 55%. This shift is attributed to the hydrophilic nature of cotton cellulose fibers, which allows for more optimal dye absorption and results in a darker color. Meanwhile, chiffon fabric exhibited a consistent flint color direction in both formulations, with increased dominance from 50% to 70% in the 24 g formulation. The thin and porous structure of chiffon limits dye penetration, causing increased dye formulation to primarily affect color intensity rather than significantly altering color direction. The interaction of *Iretsu* dye with both types of fabrics is also enhanced by the use of water glass as a fixing agent. Water glass functions as a color fixative that helps improve dye stability after the dyeing process. In *Primissima* cotton, water glass plays a role in binding the dye within the cellulose fibers, thereby strengthening the resulting color direction. Meanwhile, in chiffon, water glass tends to fix the dye on the fabric surface, allowing the resulting color direction to remain stable despite the fabric's lighter and thinner structure.

A related study was conducted by Anggun & Widowati (2024), who examined the quality of ecoprint dyeing results using three different types of mordants in relation to color direction on *Primissima* cotton fabric through an organoleptic test. The results of their study indicated that alum mordant produced an Oyster–Wood color direction, ferrous mordant (tunjung) resulted in a Smoke–Shadow color direction, and lime (calcium hydroxide) mordant produced a Wood–Carob color direction.

In addition, a study conducted by Cahyadi et al., (2024) entitled “Thematic Fashion Design Using Fabric Manipulation Dyeing and Painting Techniques” focused on examining color absorption levels in several types of polyester fabrics, including organza, tulle, chiffon, and crinoline, using *Iretsu* and dylon dyes. The results of the study demonstrated that *Iretsu* dye produced more stable colors and required a shorter processing time compared to dylon dye.

Another study by Khasanah & Widowati (2020) investigated the effect of natural dyes on the quality of ecoprint results using the steam blanket technique. In this study, one of the data collection methods involved an organoleptic test related to color direction. The analysis of color direction revealed that sappanwood dye produced a peach–punch color, turmeric yielded a tangerine–ginger color, tegeran resulted in a blonde–lemon color, mangosteen peel produced an eggnog–sand color, and merr dye produced a daffodil–mustard color.

CONCLUSION

Based on the results of the organoleptic test and the discussion conducted, it can be concluded that the use of synthetic *Iretsu* dye with water glass as a fixing agent produces different color direction tendencies on *Primissima* cotton and chiffon fabrics. These differences are influenced by fiber characteristics and fabric structure, particularly absorbency and the interaction between the dye and the fabric fibers. In *Primissima* cotton fabric, increasing the dye formulation from 12 g to 24 g causes a shift in color direction toward a darker tone, indicating the ability of cellulose fibers to absorb and retain the dye more optimally. In contrast, chiffon fabric shows a relatively stable color direction despite the increase in dye formulation, suggesting that its thin and porous structure affects color intensity more than changes in color direction. The use of water glass plays an important role in enhancing color stability by fixing the dye to the fabric fibers, both through fiber bonding in *Primissima* cotton and surface fixation in chiffon. Thus, this study confirms that *Iretsu* dye has the potential to be applied to non-polyester fabrics, with color direction characteristics influenced by fabric type and dye formulation.

REFERENCES

- Ahmad, A. F., & Hidayati, N. (2020). *Pengaruh Jenis Mordan dan Proses Mordanting Terhadap Kekuatan dan*. (January), 1–5.
- Anbarwati, S. F., Kusumastuti, A., & Marlengen, R. (2025). The Effect of Fixator Type on the Color Fastness of Cotton Fabric Dyeing with Mango Leaves Extract (*Mangifera indica* L.). *TEKNOBUGA: Jurnal Teknologi Busana Dan Boga*, 13(1), 53–58. <https://doi.org/10.15294/teknobuga.v13i1.32269>

- Anggun, & Widowati. (2024). Kualitas Hasil Ecoprint Motif Daun Jenitri dengan ZWA. *Ffej*, 13(1), 44–51. <https://journal.unnes.ac.id/sju/index.php/ffe/index>
- Arif Rachman, Yochanan, A. I. S. (2024). Metode Kualitatif, Kuantitatif Dan R&D. In *CV Saba Jaya Publishr*.
- Astuti. (2022). Pengaruh Jenis Zat Fiksasi Terhadap Ketahanan Luntur Warna Dan Arah Warna Pada Kain Mori *Primissima* Menggunakan Zat Warna Alam Buah Girang (*Leea Indica*).
- Cahyadi, B. V., Hartanto, D. D., & Malkisedek, M. H. (2024). Perancangan Thematic Fashion dengan Pemanfaatan Teknik Fabric Manipulation Dyeing dan Painting. *Jurnal Desain*, 11(2), 355. <https://doi.org/10.30998/jd.v11i2.17675>
- Candra Susanto, P., Ulfah Arini, D., Yuntina, L., Panatap Soehaditama, J., & Nuraeni, N. (2024). Konsep Penelitian Kuantitatif: Populasi, Sampel, dan Analisis Data (Sebuah Tinjauan Pustaka). *Jurnal Ilmu Multidisplin*, 3(1), 1–12. <https://doi.org/10.38035/jim.v3i1.504>
- Fadhila, A. N., Widayatno, T., & Haerudin, A. (2022). Pengaruh Variasi Jenis Dan Konsentrasi Zat Fiksasi Pada Ekstrak Daun Pepaya Sebagai Pewarna Alami Pada Kain Batik. *Narada : Jurnal Desain Dan Seni*, 9(3), 247–258. <https://doi.org/10.22441/narada.2022.v9.i3.001>
- Hapsari Kusumawardani, Annisau Nafiah, & Nurul Aini. (2021). Pelatihan Pewarnaan Batik Dengan Zat Warna Sintetis Pada Kampung Batik ‘Sujo’ Sumberejo Untuk Meningkatkan Kualitas Produksi. *Prosiding Seminar Nasional Pengabdian Kepada Masyarakat, 2021*, 584–596.
- Khasanah, A., & Widowati. (2020). Pengaruh Zat Warna Alam terhadap Kualitas Hasil Ecoprint Teknik Steam Blanket. 20(20), 106–114. <https://journal.unnes.ac.id/sju/index.php/ffe/index>
- Masnidar, L. dan N. (2017). Statistik Deskriptif. *Statistik Deskriptif*, 14(21), 5472–5476.
- Mushofa, M., Hermina, D., & Huda, N. (2024). Memahami Populasi dan Sampel: Pilar Utama dalam Penelitian Kuantitatif. *Jurnal Syntax Admiration*, 5(12), 5937–5948. <https://doi.org/10.46799/jsa.v5i12.1992>
- Ningtarich, A. P., Wahyuningsih, S. E., & Wahyuningsih, U. (2025). Exploring the Quality of Eco-Prints from Floral Waste Across Fabric Variations. *TEKNOBUGA: Jurnal Teknologi Busana Dan Boga*, 13(1), 66–71. <https://doi.org/10.15294/teknobuga.v13i1.31603>
- Ruhansih, D. S. (2017). Efektivitas Strategi Bimbingan Teistik Untuk Pengembangan Religiusitas Remaja. *QUANTA: Jurnal Kajian Bimbingan Dan Konseling Dalam Pendidikan*, 1(1), 1–10. <https://doi.org/10.22460/q.v1i1p1-10.497>
- Sari, M., Rachman, H., Astuti, N. J., Afgani, M. W., & Siroj, R. A. (2023). Explanatory Survey dalam Metode Penelitian Deskriptif Kuantitatif Jurnal Pendidikan Sains dan Komputer. *Jurnal Pendidikan Sains Dan Komputer*, 3(1), 10–16. <https://jurnal.itscience.org/index.php/jpsk/article/download/1953/1528>
- Satria, Y., & Suheryanto, D. (2016). Pengaruh Temperatur Ekstraksi Zat Warna Alam Daun Jati Terhadap Kualitas Dan Arah Warna Pada Batik. *Dinamika Kerajinan Dan Batik: Majalah Ilmiah*, 33(2), 101–110. <https://doi.org/10.22322/dkb.v33i2.1628>
- Simanungkalit, Y. S., & Syamwil, R. (2020). Teknik Ecoprint dengan Memanfaatkan Limbah Mawar (*Rosa Sp.*) pada Kain Katun. *Fashion and Fashion Education Journal (Ffej)*, 9(1), 9. <https://journal.unnes.ac.id/sju/index.php/ffe>
- Wahyu, M., Mukti, P., Sumantra, I. M., & Karuni, K. (2023). Studi Pemanfaatan Warna Alam Pada Produk Tekstil. 3, 207–213.