
Jurnal Penelitian Pendidikan

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Quality Assessment of Ecoprinted Tablecloths Using Avocado Leaves with Tunjung and Limestone Mordants

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Abstract

This study aims to determine the quality of avocado leaf ecoprint results using tunjung and limestone mordants on tablecloths. This study uses an experimental method with a quantitative approach. The object of the study is primmissima cotton fabric processed into a tablecloth with an avocado leaf ecoprint motif. The independent variable in this study is the type of mordant, namely tunjung and limestone, while the dependent variable is the visual quality of the ecoprint results which is focused on the clarity of the motif and the appearance of the colour. Data collection was carried out through organoleptic tests by three expert panellists using a rating scale of 1-5. Data were analysed descriptively in the form of percentages. The results showed that the limestone mordant obtained a percentage value of 34.44% with a less category, while the tunjung mordant obtained a percentage value of 55.56% with a sufficient category. These findings indicate that the tunjung mordant produces better visual quality ecoprint compared to limestone, especially in terms of clarity of motif and colour intensity. Thus, the type of mordant makes a difference in the quality of the avocado leaf ecoprint results, and the tunjung mordant is more recommended for producing more optimal ecoprint tablecloth products.

Keywords: ecoprint; avocado leaves; tunjung mordant; limestone; textile quality

INTRODUCTION

The current development of the textile and fashion industry is inseparable from environmental issues, particularly due to the use of synthetic dyes that have the potential to pollute water and soil. The fashion industry is one of the sectors that contributes to environmental pollution.¹ This condition has encouraged the emergence of various environmentally friendly textile innovations, one of which is the ecoprint technique. Ecoprint is a technique for dyeing and printing motifs on fabric using natural materials, especially plant parts such as leaves, flowers, and stems.^{2,3,4} This technique is considered more sustainable because it uses natural materials and minimizes the use of hazardous chemicals.⁵

¹Puspita Kharisma Subagyo and soelistyowati soelistyowati, "Pengaruh Zat Pewarna Sintetis Terhadap Pewarnaan Kain Batik," *FOLIO* 2, no. 2 (January 17, 2023), doi:10.37715/folio.v2i2.3476.

²Miftahul Jannah et al., "The Effect of Alum, Tunjung, and Betel Lime Mordants on Ecoprinting Insulin Leaves Using Combined Pounding and Blanket Techniques on Yamaha Silk Dyed with Gambir Extract," *TEKNOBUGA: Jurnal Teknologi Busana Dan Boga* 13 (October 22, 2025): 108–18, doi:10.15294/teknobuga.v13i2.34272

³Amalia and Akhtamimi, "Studi Pengaruh Jenis Dan Konsentrasi Zat Fiksasi Terhadap Kualitas Warna Kain Batik Dengan Pewarna Alam Limbah Kulit Buah Rambutan (*Nephelium Lappaceum*)."

⁴Ida Ayu Kusumaningtyas and Urip Wahyuningsih, "Analisa Hasil Penelitian Tentang Teknik Ecoprint Menggunakan Mordan Tawas, Kapur, Dan Tunjung Pada Serat Alam," *Jurnal Online Tata Busana* 10, no. 3 (September 26, 2021): 9–14, doi:10.26740/jurnal-online-tata-busana.v10i3.42976.

⁵Kristanti Kristanti, Noor Ramadhani, and Purwosiwi Pandansari, "Ecoprint Techniques as An Environmentally Friendly Fashion Product," *Edusight International Journal of Multidisciplinary Studies* 1 (August 9, 2024), doi:10.69726/eijoms.v1i2.34.

The success of ecoprinting is greatly influenced by the type of natural material and fabric used. One potential natural material is avocado leaves (*Persea americana*). Avocado leaves are known to contain tannins and flavonoids, which can play a role in the formation of natural colours in fabrics.^{6,7} In addition to dyes, fabric selection also determines the quality of ecoprinting

Primissima cotton is a natural fiber fabric with a smooth texture, a relatively flat surface, and good absorbency. These characteristics support the absorption of natural dyes, making the resulting pattern more visible.⁸

Another important factor in the ecoprint process is the use of mordant. Mordant functions as a binding agent between natural dyes and fabric fibers so that the resulting colours can be sharper, stronger, and more durable.^{9,10} Common types of mordants used in ecoprinting include alum, tunjung, and limestone. Different types of mordants can produce different colour variations, pattern sharpness, and visual characteristics.¹¹

In this study, the ecoprinting process was carried out using two types of mordants: tunjung and limestone. Tunjung mordant contains iron compounds, which tend to produce darker, more concentrated, and more contrasting colours.¹² In contrast, limestone tends to produce brighter colours with different visual characteristics.¹³ Previous research shows that variations in mordant can make a difference in the quality of ecoprint results, both in terms of colour, clarity of motif, and colour fastness.^{14,15}

Based on this description, this study aims to test the quality of avocado leaf ecoprints using tunjung mordant and limestone on tablecloths. Quality testing focused on visual aspects, particularly the clarity of the avocado leaf motif and colour rendering. The results are expected to serve as a reference in the development of environmentally friendly textile products based on local natural materials.

METHOD

Research Design

This study employed an experimental method with a quantitative approach. The experimental method was used because the study treated the fabric with different types of mordants and then compared the quality of the resulting ecoprint results. The quantitative approach was used because the panelists' assessment data were analyzed in the form of scores and percentages. According to Creswell, experimental research is a quantitative approach used to test cause-and-effect relationships by administering certain treatments under controlled conditions.¹⁶

Objects, Variables, and Treatments

The object of this research is Primissima cotton fabric processed into a tablecloth using an ecoprint

⁶Risna Erni Yati Adu et al., "Extraction and Application of Avocado (*Persea Americana* Mill.) Seed Tannins as a Biomordant for Natural Dyeing of Timorese Handwoven Fabric," *Al-Kimia* 11, no. 2 (December 28, 2023), doi:10.24252/al-kimia.v11i2.41015.

⁷Herti Utami et al., "The Leaching of Natural Dyes from Avocado (*Persea Americana* Mill) Seeds Using the Ultrasonic-Assisted Extraction Method and Its Application to Cellulose Fibers," *Jurnal Rekayasa Kimia & Lingkungan* 16 (November 15, 2021): 100–108, doi:10.23955/rkl.v16i2.20140.

⁸Kusumaningtyas and Wahyuningsih, "Analisa Hasil Penelitian Tentang Teknik Ecoprint Menggunakan Mordan Tawas, Kapur, Dan Tunjung Pada Serat Alam."

⁹Har Bhajan Singh and Kumar Avinash Bharati, "4 - Mordants and Their Applications," in *Handbook of Natural Dyes and Pigments* (Woodhead Publishing India, 2014), 18–28, doi:https://doi.org/10.1016/B978-93-80308-54-8.50004-6.

¹⁰Shahidul Islam et al., "Role of Mordants in Natural Fabric Dyeing and Their Environmental Impacts," *Environmental Science and Pollution Research* 32, no. 2 (2025): 452–68, doi:10.1007/s11356-024-35746-w.

¹¹Umi Qomariah, Vina Bashiroh, and Miftachul Chusnah, "Ekspresi Warna Ecoprint Daun Jati (*Tectona Grandis*) Pada Katun Primissima Dengan Mordan Tawas, Tunjung Dan Kapur," *AGROSAINTEFIKA* 5 (November 30, 2022): 17–23, doi:10.32764/agrosaintifika.v5i1.2972.

¹²Yandri et al., "Exploration of Natural Dyes from Local Plants in West Sumatera for the Development of Sustainable Environmentally Based Ecoprint," *Brazilian Journal of Biology* 86 (2026).

¹³Kenny Artika, "The Effect Of Mordant Alum, Tunjung and Betel Lime on The Ecoprint Results of Kersen Leaves (*Muntingia Carabura* L) On Semi-Wool Materials Using Pounding-Steam Technique," *EDUTECH* 24 (April 16, 2025): 503–21, doi:10.17509/e.v24i1.80496.

¹⁴Bherly Arfahdini and Adriani Sukardi, "Pengaruh Mordan Tawas, Tunjung, Dan Kapur Sirih Terhadap Hasil Ecoprint Daun Semangka (*Citrullus Lanatus*) Pada Kain American Drill Dengan Teknik Hammering," *EDUTECH* 24 (April 16, 2025): 360–72, doi:10.17509/e.v24i1.80272.

¹⁵Jannah et al., "The Effect of Alum, Tunjung, and Betel Lime Mordants on Ecoprinting Insulin Leaves Using Combined Pounding and Blanket Techniques on Yamaha Silk Dyed with Gambir Extract."

¹⁶J W Creswell and J D Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (SAGE Publications, 2022), https://books.google.co.id/books?id=Rkh4EAAAQBAJ.

technique with avocado leaves. The independent variables in this study are the types of mordant, namely the tunjung mordant (X1) and the limestone mordant (X2). The dependent variable is the visual quality of the ecoprint results (Y), which includes the clarity of the avocado leaf motif and the visual appearance of the colour.

Research Tools and Materials

The tools used in this study included measuring cups, scales, meters, buckets, steamers, stoves, raffia rope, scissors, hoses, plastic, spoons, wooden spatulas, hangers, and clothespins. The materials used included prmissima cotton fabric, avocado leaves, tunjung, limestone, and water.

Research Procedures

The ecoprinting process involves several stages: fabric preparation (scouring), mordanting according to the desired treatment, arranging the avocado leaves on the fabric, rolling the fabric, tying, steaming, unrolling, drying, and observing the results. The treatments are differentiated based on the type of mordant used, namely tunjung mordant and limestone mordant.

Data Collection Techniques

Data was collected through organoleptic testing or expert panel assessments. Three panelists participated. The panellists assessed the visual quality of the ecoprinted products using an assessment instrument sheet. Aspects assessed included the clarity of the avocado leaf motif and colour presentation. Assessments were conducted on a scale of 1-5, with the criteria as shown in Table 1.

Table 1. Organoleptic Assessment Scale

Score	Criteria
5	Very good
4	Good
3	Enough
2	Not enough
1	Very less

Data Analysis Techniques

The panellists' assessment data were analysed using quantitative descriptive techniques. The scores obtained from the panellists were summed and then calculated as a percentage to determine the quality of the ecoprint results for each treatment. The percentage formula used is as follows.

$$P = (F / N) \times 100\%$$

Note:

P = percentage value of the quality sought; F = total score obtained;

N = ideal maximum score.

The percentage results were then categorized based on the quality criteria in Table 2. These criteria were used to interpret the quality level of the ecoprint results from each mordant treatment.

Table 2. Quality Percentage Criteria

Percentage Range	Category
81-100%	Very good
61-80%	Good
41-60%	Enough
21-40%	Not enough
0-20%	Very less

RESULTS AND DISCUSSION

The research results were obtained from three expert panellists' assessments of the visual quality of

avocado leaf ecoprints on tablecloths. The assessments were conducted on two samples: one with limestone mordant and one with tunjung mordant. The assessment data were then calculated as percentages to determine the quality trends for each treatment, as shown in Table 3.

Table 3. Percentage of Ecoprint Quality Test Results

No.	Mordant Type	Percentage	Category
1	Limestone	34.44%	Not enough
2	Tunjung	55.56%	Enough

Based on Table 3, the ecoprinting results using the tunjung mordant obtained a higher percentage value compared to the limestone mordant. The use of the limestone mordant resulted in a percentage of 34.44%, which is categorized as poor. This result indicates that the visual quality of the ecoprinting using the limestone treatment is not optimal, mainly because the colour appears less intense and the leaf motif is less clear. This finding is in line with Qomariah et al., which shows that limestone tends to produce lighter colours, but the colour strength and pattern definition can be lower compared to certain other mordants.¹⁷

Meanwhile, the use of tunjung mordant resulted in a percentage of 55.56%, which is categorized as sufficient. This value indicates that tunjung mordant provides better visual quality than limestone.¹⁸ Visually, the tunjung mordant produces a more intense colour and a more defined leaf pattern.¹⁹ This condition can be associated with the iron compound content in the tunjung, which tends to produce darker and more contrasting colours on the fabric.²⁰ These results support the findings of Arfahdini and Sukardi and Jannah et al. that different types of mordants can produce differences in visual quality in ecoprint products.^{21,22}

The difference in results between the two mordants shows that the choice of mordant is an important aspect in the manufacture of ecoprint products.²³ In tablecloths, clarity of motif and strong colour are crucial, as the product not only serves a functional purpose but also provides aesthetic value. Therefore, the tunjung mordant is more appropriate if the primary goal of ecoprinting is to achieve a more visible avocado leaf motif and stronger colours.

However, the results of this study should be interpreted as a descriptive assessment based on organoleptic testing by three expert panellists. This study did not utilize laboratory tests such as colour fastness, $L^*a^*b^*$ colour value measurements, or colour strength tests. Therefore, further research could include these tests to allow for a more comprehensive analysis of the quality of ecoprinted products.

CONCLUSION

Based on the research results, it can be concluded that the type of mordant makes a difference in the quality of the avocado leaf ecoprint results on the tablecloth. The tunjung mordant produces a percentage value of 55.56% with a sufficient category, while the limestone mordant produces a percentage value of 34.44% with a poor category. These results indicate that the tunjung mordant is better than limestone in producing a more intense colour appearance and a clearer leaf motif. Thus, the tunjung mordant is more recommended for making avocado leaf ecoprint tablecloths. Future research is recommended to add colour fastness tests and instrumental colour measurements so that the quality assessment results are more robust and objective.

¹⁷Qomariah, Bashiroh, and Chusnah, "Ekspresi Warna Ecoprint Daun Jati (Tectona Grandis) Pada Katun Primiissima Dengan Mordan Tawas, Tunjung Dan Kapur."

¹⁸Ayu Irna Ningsih and Adriani, "The Effect of Betel Lime, Alu, And Tunjung Mordants on The Results of Primisima Cotton Fabric Dyeing Using Harendong Bulu (Clidemia Hirta) Leaf Extract," *Inovasi Pembangunan : Jurnal Kelitbangan* 14, no. 1 (February 4, 2026), doi:10.35450/jip.v14i1.1590.

¹⁹Farihah et al., "Ecoprint Motif Analysis Using Young Teak Leaves with Tungging Fixation Applied to Artificial Fibers," *Jurnal Penelitian Pendidikan IPA* 11, no. 12 (December 25, 2025): 1241–48, doi:10.29303/jppipa.v11i12.13178.

²⁰Md. Reazuddin Repon et al., "Textile Dyeing Using Natural Mordants and Dyes: A Review," *Environmental Chemistry Letters* 22, no. 3 (2024): 1473–1520, doi:10.1007/s10311-024-01716-4.

²¹Arfahdini and Sukardi, "Pengaruh Mordan Tawas, Tunjung, Dan Kapur Sirih Terhadap Hasil Ecoprint Daun Semangka (Citrullus Lanatus) Pada Kain American Drill Dengan Teknik Hammering."

²²Jannah et al., "The Effect of Alum, Tunjung, and Betel Lime Mordants on Ecoprinting Insulin Leaves Using Combined Pounding and Blanket Techniques on Yamaha Silk Dyed with Gambir Extract."

²³S Nurmasitah et al., "The Impact of Different Types of Mordant on the Eco-Print Dyeing Using Tingi (Ceriops Tagal)," *IOP Conference Series: Earth and Environmental Science* 969, no. 1 (2022): 012046, doi:10.1088/1755-1315/969/1/012046.

ACKNOWLEDGMENTS

The author would like to express his gratitude to all parties, especially the leadership of Semarang State University, his supervisor, all lecturers and staff, his parents, family, friends, and everyone who has offered prayers, support, and assistance in the preparation of this article, including himself, for his perseverance in completing it. May all good deeds be rewarded by Allah SWT, and may this work be beneficial.

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