E-BOOK OF EXTENDED ABSTRACT

THE 14TH INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2025

14TH INDES 2025

ENVIRONMENTAL • SOCIAL • GOVERNANCE

UNIVERSITI TEKNOLOGI MARA

RIICAN Research Innovation Industry Community & Alumni Network

E-BOOK OF EXTENDED ABSTRACT

THE 14th INTERNATIONAL
INVENTION, INNOVATION &
DESIGN COMPETITION 2025

Organized by:

Office of Research, Industry,
Community & Alumni Network
UiTM Perak Branch

Perpustakaan Negara Malaysia Cataloguing in Publication Data

No e- ISBN: 978-967-2776-52-9

Cover Design: Dr. Mohd Khairulnizam Ramlie

Typesetting : Georgia

EDITORIAL BOARD

LEAFTHER: ECO-FRIENDLY LEATHER FROM NATURE'S WASTE

Dina Ayu Atika, Muhammad Hisyam Rabbani, Muhammad Jiddan Khairuzaman, Ulinnuha Aqwa

Department of Economics, Faculty of Business and Economics
Universitas Islam Indonesia
Kaliurang St No.km 14.5, Karawitan, Umbulmartani, Ngemplak, Sleman Regency, Special Regional of Yogyakarta

22313016@students.uii.ac.id, 22313024@students.uii.ac.id
22313026@students.uii.ac.id, *23313079@students.uii.ac.id*

ABSTRACT

Banana frond fibers, coffee grounds and orange peels are often regarded as worthless waste, used only as compost or growing media. However, innovative environmentally-based approaches allow these wastes to be processed into sustainable leather alternatives. This solution not only reduces the stockpile of organic waste, but also addresses the need for environmentally unfriendly substitutes for animal leather and plastic-based synthetics. This innovation is not only environmentally friendly, but also opens up circular economy opportunities with high economic value. LEAFTHER is an eco-friendly leather material solution made from waste with a mixture of glycerin and alginate to produce a flexible, strong and durable texture. This product is suitable for various accessories such as wallets, lanyards, bags and identity card holders, which at the same time emphasize functional and aesthetic values. LEAFTHER products support efforts to reduce organic waste while encouraging economic development through raw material innovation from natural sources, thus becoming an innovative solution in the environmentally responsible and sustainable fashion industry.

Keywords**:** leather, organic waste, banana frond fibers, coffee grounds, orange peel, environmentally friendly, sustainable

1. INTRODUCTION

Agricultural, industrial, and household wastes such as banana frond fibers, coffee grounds, and orange peels are organic wastes that are often not optimally utilized. Increasing awareness of sustainability and environmental issues is also driving demand for eco-friendly materials that can replace conventional materials, including animal leather and synthetic leather. LEAFTHER, as a leather alternative, shows attractive texture characteristics and resembles synthetic leather with a natural touch that adds to the aesthetic value of the product. The presence of cellulose compounds in both wastes forms a strong fiber structure, while the addition of glycerin and sodium alginate plays an important role in creating flexibility and durability of the material (Sari Purnavita et al, 2020). This combination of materials makes LEAFTHER comfortable to use and does not crack easily, making it suitable for various products such as wallets, lanyards, and identity card holders. The conventional leather industry itself has a large ecological impact. The tanning process uses harmful chemicals such as chromium and formaldehyde, and requires large amounts of water (Singaraj et al, 2019). The resulting wastewater pollutes soil and water, posing risks to human health and ecosystems, this practice is far from sustainable and exacerbates environmental degradation. In contrast, the production of these leathers uses a greener process starting from waste drying, fiber processing, blending with natural binders, to shaping and dyeing stages using natural materials.

2. METHODOLOGY

2.1 Materials: Banana frond fiber, coffee grounds, orange peel, voal cotton, glycerin, alginate, water.

2.2 Tools: Blender, sieve, scale, pot, mold, oven.

2.3 Leather Manufacturing Process
The process begins with the collection of waste in the form of coffee grounds, orange peels and banana frond fibers from local Micro, Small and Medium Enterprises (MSMEs). The materials are then cleaned and dried until the moisture content is significantly reduced. Next, the materials were pulverized into fiber powder and mixed with water and binding agents such as glycerin and alginate. This mixture is cooked and molded and then dried using direct sunlight or low-temperature oven methods to avoid damaging the natural components. After complete drying, the leather sheets went through a natural coloring and coating process to improve their durability and visual appearance. Evaluation was conducted on flexibility, durability and surface texture to determine the suitability of the material as an alternative leather. The drying process has a significant effect on the final material.

Oven drying at low temperatures (±60°C) takes about 6-8 hours, resulting in a more even and dense leather surface. Meanwhile, natural sun drying takes 2-3 days depending on light intensity and air humidity, but gives a more natural look. The composition of the ingredients also plays an important role in determining the flexibility and strength of the leather, a mixture of binder proportions such as glycerin and alginate of around 30% provides a flexible texture (Sari Purnavita et al, 2020). Meanwhile, banana frond fibers show distinct advantages due to their long and strong fiber structure, these fibers provide higher tensile resistance and increase the dimensional stability of the material. In addition, the high lignocellulose content in banana fronds contributes to mechanical strength and resistance to deformation (Singaraj et al 2019). The addition of natural oils to the blends was also shown to improve the flexibility as well as crack resistance of all three types of materials. These results indicate that the choice of base material and the proportion of the composition greatly influences the final quality of the leather produced.

3. FINDINGS

In terms of durability, LEAFTHER is able to withstand folding and pressure in everyday use. While it has not been designed for extreme use like animal leather, it is tough enough for light to medium applications, showing that it has qualities worth considering as an alternative material that is both functional and aesthetically pleasing. More than just a new material, LEAFTHER also carries significant economic potential. By utilizing waste that has been neglected, the production process becomes more efficient and low-cost. This opens up great opportunities for the development of circular economy-based businesses and eco-friendly creative industries. This product not only offers a sustainable solution, but also shows how simple innovations can have a positive impact on the environment and the economy at the same time. The benefits that LEAFTHER offers extend to people's lives more broadly. By turning waste into valuable products, it contributes to reducing environmental pollution while fostering awareness of the importance of sustainable lifestyles (Nurathirah et al, 2025). This innovation paves the way for the community, especially MSME players and creative communities, to create products that are not only functional but also highly marketable. Indirectly, LEAFTHER supports the shift in consumption culture towards recycled-based products that are more friendly to the earth and future generations.

4. CONCLUSION

In the future, leather will be inseparable from sustainability. The need for materials that are not only functional, but also eco-friendly, ethical and affordable is increasingly becoming a priority in various sectors, from fashion, product design to automotive. This is where organic waste-based leather alternatives like LEAFTHER show their relevance. LEAFTHER, as a leather alternative exhibiting attractive textural characteristics and resembling synthetic leather with the utilization of waste as a base material for leather manufacturing is proving promising as an innovative and sustainable solution. Not only does it help reduce organic waste, it also offers an eco-friendly alternative to conventional leather. Test results show that the leather produced has functional characteristics that are suitable for various purposes. This innovation is a real step in supporting local economic empowerment as well as in the transition towards a green economy and sustainable development based on local resources. With low production costs and locally available raw materials, LEAFTHER has the potential to encourage the growth of community-based micro-industries that strengthen the economy. In addition to supporting the reduction of carbon footprint and hazardous waste, the use of alternative leather also opens up opportunities for product diversification in various sectors such as fashion, craft and interior. Going forward, LEAFTHER can evolve not only as a technical solution, but also as a sustainable design strategy with social and ecological impact.

REFERENCES

Mirra Amanda Syamsyyah, Myra Wardati Sari, Cengristitama, & Lulu Nurdini. (2023, 01). *The Effect of Temperature and Time of Drying from Corn Starch Bioplastic on Biodegradation Time*, *20*.

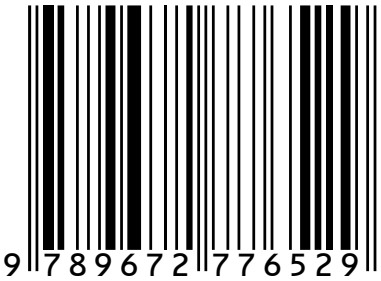
Nurathirah Nadiah Mohd Faisal, Muhammad Farid Shaari, & Syaidatul Qaisha Noor Azmi. (2025). Analysis on Microstructural Features and Tensile Properties of Acrylic-Coated Banana-Polyester Synthetic Leather. *6*(1), 883-892. https://doi.org/10.30880/peat.2025.06.01.096

Sari Purnavita, Dyionisius Yoga Subandriyo, & Ayu Anggraeni. (2020). *Penambahan Gliserol terhadap Karakteristik Bioplastik dari Komposit Pati Aren dan Glukomanan*, *16*, 19-25.

Sureshkumar Perumal Singaraj, Kavati Phebe Aaron, Krishnaraj Kaliappa, Karthikeyan Kattaiya, & Mohan Ranganathan. (2021). Investigations on Structural, Mechanical and Thermal Properties of Banana Fabrics for Use in Leather Goods Application. *Journal of Natural Fibers*, *18*(11), 1618-1628. https://doi.org/10.1080/15440478.2019.1697982

E-Book of Extended Abstract THE 14th INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2025

e ISBN 978-967-2776-52-9



Unit Penerbitan UiTM Perak
.

(online)