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# **E-PROCEEDINGS**

## **INTERNATIONAL TINKER INNOVATION & ENTREPRENEURSHIP CHALLENGE (i-TIEC 2025)**

"Fostering a Culture of Innovation and Entrepreneurial Excellence"



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**23 January 2025**  
**PTDI, UiTM Cawangan Johor**  
**Kampus Pasir Gudang**

**ORGANIZED BY:**

Electrical Engineering Studies, College of Engineering  
Universiti Teknologi MARA (UiTM) Cawangan Johor  
Kampus Pasir Gudang

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## PREFACE

It is with great pleasure that we present the e-proceedings of International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), which compiles the extended abstracts submitted to the International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), held on 23 January 2025 at **PTDI, Universiti Teknologi MARA (UiTM) Cawangan Johor, Kampus Pasir Gudang**. This publication serves as a valuable resource, showcasing the intellectual contributions on the invention and innovation among students, academics, researchers, and professionals.

The International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), organized under the theme "Fostering a Culture of Innovation and Entrepreneurial Excellence," is designed to inspire participants at various academic levels, from secondary students to higher education students and professionals. The competition emphasizes both innovation and entrepreneurship, encouraging the development of product prototypes that address real-world problems and have clear commercialization potential. By focusing on technological and social innovations, i-TIEC 2025 highlights the importance of turning creative ideas into viable, market-ready solutions that can benefit users and society. The extended abstracts in this e-proceedings book showcase the diverse perspectives and depth of research presented during the event, reflecting the strong entrepreneurial element at its core.

We extend our sincere gratitude to the contributors for their dedication in sharing their innovation and the organizing committee for their hard work in ensuring the success of the event and this publication. We also appreciate the support of our collaborators; Mass Rapid Transit Corporation Sdn. Bhd. (MRT Corp), Universitas Labuhanbatu, Indonesia (ULB), Universitas Riau Kepulauan, Indonesia (UNRIKA) and IEEE Young Professionals Malaysia, whose contributions have been instrumental in making this event and publication possible.

We hope that this e-proceedings book will serve as a valuable reference for researchers, educators, and practitioners, inspiring further studies and collaborations in both innovation and entrepreneurship. May the knowledge shared here continue to spark new ideas and market-ready solutions, advancing our collective expertise and fostering the growth of entrepreneurial ventures.

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## **B-ST150: UTILIZATION OF PALM FROND WASTE IN THE MANUFACTURE OF LIQUID SMOKE FOR SUSTAINABLE AGRICULTURE**

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### **ABSTRACT**

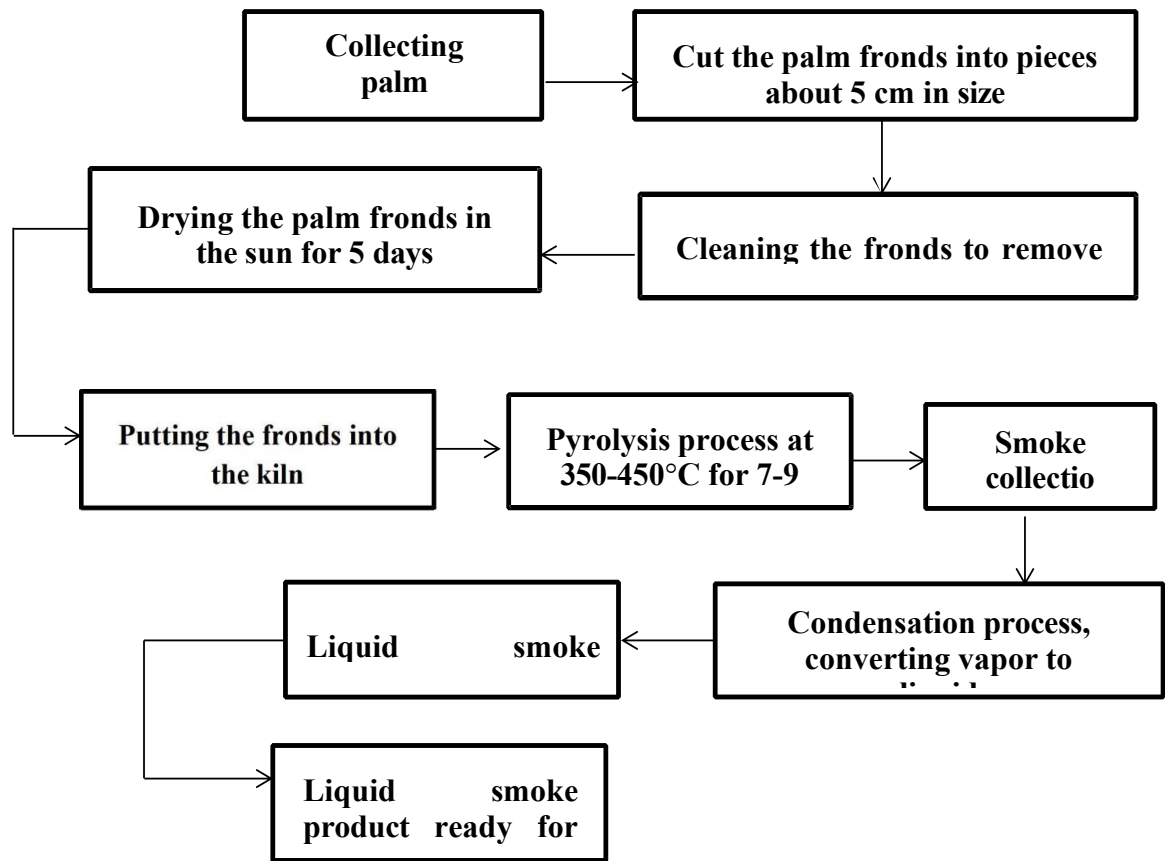
The utilization of palm frond waste as raw material for liquid smoke production is a sustainable innovation in supporting environmentally friendly agriculture. Palm fronds, which are usually considered waste, have high potential to be processed into liquid smoke through pyrolysis process. Liquid smoke contains organic compounds such as organic acids, phenols, and carbonyl compounds that can be utilized as natural pesticides, organic preservatives, and plant growth stimulants. This study aims to assess the production method, chemical composition, and effectiveness of liquid smoke from palm fronds in agricultural applications. The results showed that liquid smoke can improve soil fertility, reduce the use of synthetic pesticides, and support sustainable agricultural practices. The utilization of palm frond waste as liquid smoke not only provides a solution for plantation waste management, but also contributes to improving the efficiency and sustainability of the agricultural sector.

**Keywords:** oil palm, palm fronds, pyrolysis, liquid smoke.

### **1. Product Description**

Liquid Smoke is an organic product produced from the pyrolysis process of biomass, such as wood, coconut shells, rice husks, or agricultural waste, which is processed into a versatile liquid containing active compounds such as phenols, carbonyls, and organic acids. The product is designed to improve soil fertility, stimulate plant growth, while protecting plants from pests and diseases naturally. Liquid smoke has antibacterial, antifungal, and natural pesticide properties, making it safe to use for various types of plants without the risk of chemical pollution. The advantage of liquid smoke lies in its ability to improve soil structure by increasing the activity of beneficial microorganisms and binding nutrients. Compared to chemical fertilizers, liquid smoke is more economical, environmentally friendly, and supports sustainable agriculture. The main benefits of this product include increased crop productivity, natural protection from pests and diseases, and reduced dependence on chemical fertilizers and pesticides. Liquid smoke can be used for various applications, such as in food crops, horticulture, and plantations, either through direct spraying on the leaves or watering into the soil. With innovative formulations, liquid smoke is an effective solution for modern agriculture that prioritizes efficiency, sustainability, and environmental sustainability.

## 2. Flow Charts.



**Figure 1.** Stages of Making Liquid Smoke

This flow chart illustrates the steps that need to be taken to make liquid smoke from palm fronds. Liquid smoke itself has many benefits, such as improving soil quality as well as pest and disease control.

**Table 1.** Chemical content of liquid smoke from oil palm fronds

| <i>Chemical content</i> | <i>Quantity /100 grams</i> |
|-------------------------|----------------------------|
| <i>Asetic Acid</i>      | 1,4032                     |
| <i>Ca - Mineral</i>     | 0,6096                     |
| <i>C - Organic</i>      | 0,3177                     |
| <i>N - Urea</i>         | 0,0836                     |
| <i>P - Phospat</i>      | 0,0921                     |
| <i>Residu (Tar)</i>     | 4,7300                     |



From **Table 1**, it is known that acid content has the largest percentage compared to the others. Acid content is one of the chemical properties that determine the quality of liquid smoke. Organic acids that have a high role in utilization of liquid smoke is acetic acid. Acetic acid is formed partly from lignin and partly from the carbohydrate component of cellulose. In addition, liquid smoke also contains compounds that plants need such as Ca, C, N and P. This proves that liquid smoke can be used as fertilizer.

### **3. Novelty and uniqueness**

Liquid smoke is a unique innovation because it is based on organic waste using palm frond waste, thus reducing waste while creating added value from previously unused materials. Its manufacturing process that uses environmentally friendly pyrolysis, minimal harmful emissions, and free of synthetic chemicals makes it a product that supports sustainability. Apart from being a fertilizer, this product has a dual function as a natural pesticide, antibacterial, and antifungal, providing additional protection for plants without harming the ecosystem. Containing organic compounds such as carbonyls and organic acids, this fertilizer increases the absorption of nutrients by plants and improves soil quality. In addition, liquid smoke also has the advantage of being a wood varnish that can make wood more durable and long-lasting. Liquid smoke is also flexible in its use, either through leaf spraying, soil watering, making it suitable for various types of plants and land conditions. In addition, this product helps reduce dependence on harmful chemical fertilizers and is an economical solution for farmers, especially since the raw materials are cheap and readily available. With its novelty and uniqueness, liquid smoke not only increases crop yields, but also has a positive impact on the environment.

### **4. Benefits to mankind**

Liquid smoke has significant benefits for humans, especially in supporting the needs of environmentally friendly and sustainable agriculture. This product can help increase soil fertility, improve soil structure, and stimulate plant growth, thus supporting the creation of more abundant and quality crops. As a natural pesticide, liquid smoke also protects plants from pests and diseases without causing negative impacts on the environment or human health. In addition, this fertilizer helps utilize organic waste into value-added products, reduces pollution, and provides an economical solution for farmers. Its synthetic chemical-free production process makes this fertilizer safe to use, both in small-scale and large-scale farming. With its contribution to increased food yield, environmental conservation, and efficient resource management, liquid smoke provides extensive benefits to humans in meeting food needs and maintaining a balanced ecosystem.

### **5. Innovation and Impact of Entrepreneurship**

Liquid smoke is an innovation that provides new solutions in agriculture and the environment. The innovation lies in its organic waste-based production process through pyrolysis, thus not only reducing environmental pollution but also creating added value from previously unutilized materials. In terms of entrepreneurship, liquid smoke opens up new

business opportunities, especially among farmers, small businesses, and rural communities. With cheap and abundant raw materials, a simple production process, and a wide market in the agricultural sector, this product can be a source of additional income while supporting local economic growth. The impact is not only on increasing income, but also on creating new jobs. With this innovation, liquid smoke makes a real contribution to the development of a more modern and environmentally friendly agribusiness sector.

## 6. Acknowledgment

Liquid smoke has a very promising commercialization potential due to its multifunctionality, environmental friendliness, and abundant organic raw materials. With the increasing global awareness of sustainable agriculture and the need for organic products, liquid smoke is a relevant solution to replace chemical fertilizers and pesticides. Its efficient and low-cost production process enables businesses to offer products at competitive prices, while its versatility in use on a wide range of crops expands the market reach. In addition, the global demand trend for organic agricultural products opens up significant export opportunities. With the development of marketing strategies such as educational campaigns, partnerships with farmers, and distribution through digital platforms, liquid smoke can become a superior product that is not only financially profitable but also has a positive impact on the environment and the sustainability of the agricultural sector.

## 7. Authors' Biography



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