

EFFECTIVENESS OF TROPICAL PLANT CUTIN EXTRACTS TO WATERPROOF FABRIC

(How Cutin Extracts can keep you dry)

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1. Introduction

Tropical countries, such as Indonesia, experience high amounts of rainfall each year. Hence, there is a constant demand of water resistant apparel. Unfortunately, Polyurethane and PVC, which are commonly utilized in the manufacture of water resistant apparel, are non-biodegradable and are classified as potential human carcinogens by the US Environmental Agency. Therefore, alternative ways of waterproofing that is environmentally friendly is an essential.

Three tropical plant species are utilized in this research; *Eichhornia crassipes* (water hyacinth), *Musa paradisiaca* (Banana) and *Colocasia esculenta* (Taro). These plants are extremely abundant in Indonesia and their mature leaves are often disregarded, thus, they are suitable for waterproofing fabrics.

2. Experiment Design

In this research, we used *Eichhornia crassipes*, *Musa paradisiaca* and *Colocasia esculenta* fresh leaves to extract the cutin as waterproof agent. Extraction process conducted by using boiled hexane (60°C for 10 minutes) and refrigerator for 20 hours to separate the cutin and hexane solution. Cutin product from three leaves filtered through the fabric, brushed evenly and left until dry. To compare the waterproofing ability between these types of leaves, we conducted test for wicking properties of the fabric by pouring 10 g of water on the fabric then measured the mass of water that passed through it for 1 minute.

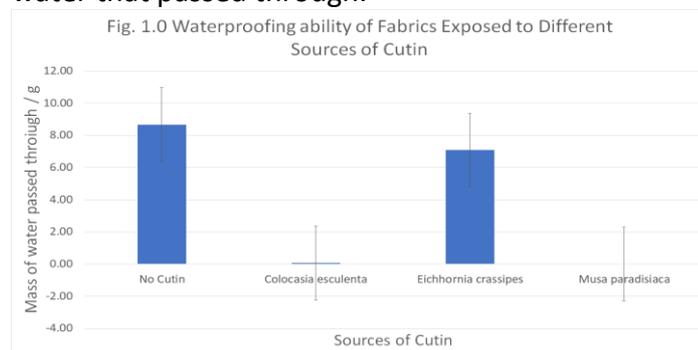
3. Result

Result of the wicking properties for the three leaves showed that *Musa paradisiaca* have the most effective waterproof agents as seen in Table.

Sources of Cutin	Mass of water that pass through the fabric / g										mean
	1	2	3	4	5	6	7	8	9	10	
No Cutin	8.6	8.7	8.4	8.6	8.7	8.8	8.7	8.7	8.6	8.8	8.66
<i>Colocasia esculenta</i>	0.2	0	0	0.3	0	0.2	0	0	0	0	0.07
<i>Eichhornia crassipes</i>	7.6	6.5	6.4	5.9	7.8	7.3	5.9	8.2	8.2	7	7.08
<i>Musa paradisiaca</i>	0	0	0	0	0	0	0	0	0	0	0

Table 1.0 Comparison of wicking properties from Banana, Taro and water hyacinth

The most effective cutin extract is the *Musa Paradisiaca* cutin extract with 0g of water that passed through, as well as *Colocasia esculenta* with 0.07g of water that passed through. The least effective is *Eichhornia crassipes* which has 7.08g of water that passed through.



Graph 1. Waterproofing ability of fabrics exposed to different sources of cutin

The bar graph above showed that the error bars for fabric with cutin extracts from *Musa paradisiaca* and *Colocasia esculenta* are not overlapping with the error bars from fabric without cutin and fabric with cutin extract from *Eichhornia crassipes* so this indicates a possible significant difference among the fabrics with different cutin extracts. However, error bars of cutin extract of *Eichhornia crassipes* and fabric without cutin overlaps, the same with error bars of *Musa paradisiaca* and *Colocasia esculenta* which means there is no significant difference.

4. Conclusion

Cutin extracts of *Musa paradisiaca* and *Colocasia esculenta* are effective waterproofing agents. Therefore, these leaves could be utilized in manufacturing eco-friendly waterproof apparel. However, based on this method, *Eichhornia crassipes* is not an effective waterproofing agent.

5. References

[1] Kimura, Toshinori, N. Shimizu, T. Yanagida. Extraction of Wax from Banana Leaves as an

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