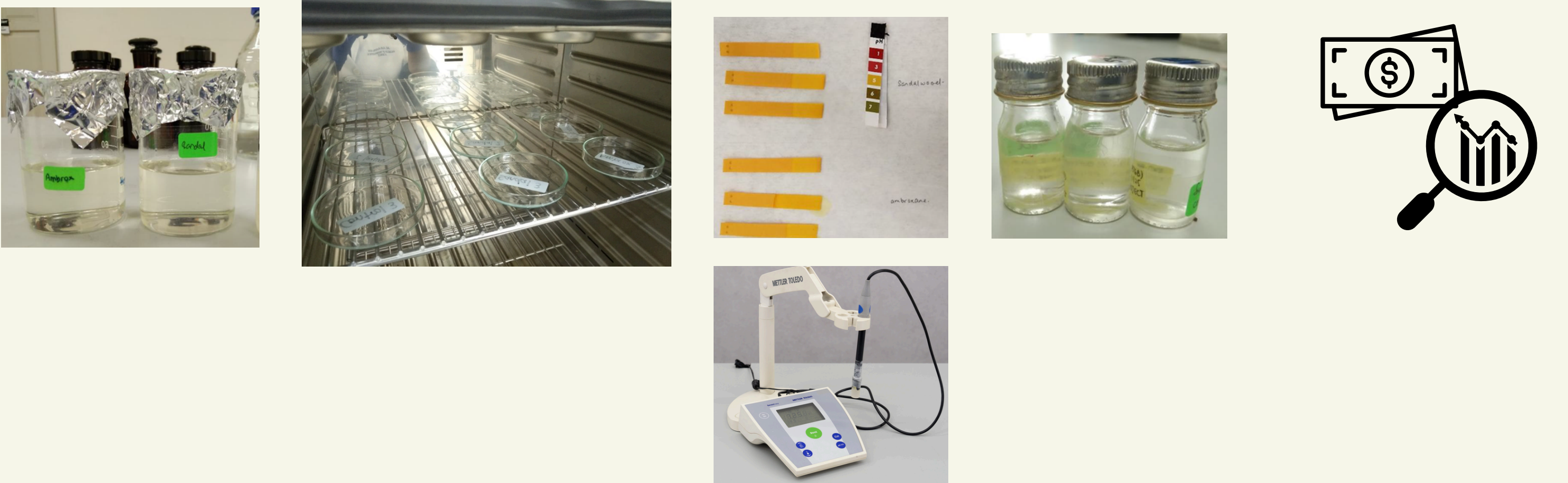


Introduction

Problem	Scents Fade Too Quickly Perfume users today face a common frustration which is scents that fade too quickly. Despite advancements in perfume formulation, creating a long-lasting fragrance without overpowering the senses or compromising on safety remains a challenge.
Limitation	Many commercial perfumes rely heavily on high concentrations of essential oils to extend longevity, but this isn't always ideal, especially when it comes to affordability and skin compatibility. While essential oils are effective for boosting scent retention, their excessive use has been linked to skin sensitivity and allergic reactions, particularly among users with sensitive skin. In Malaysia's hot and humid climate, sweat and environmental factors also speed up the evaporation of fragrances, making longevity even harder to achieve.
Solution	Although synthetic fixatives offer one potential workaround, not all of them balance performance, safety, and cost effectively. On top of that, branded perfumes that use carefully designed fixative blends tend to be expensive and inaccessible to average consumers, while local alternatives often end up being too intense due to the higher essential oil content.
Aim	This study compares a natural fixative, sandalwood essential oil, with a synthetic alternative, Ambroxan, to evaluate their effects on fragrance longevity, pH balance, formulation stability, and cost-effectiveness.
Key insight	Ambroxan showed better performance in slowing down evaporation and was more cost-effective, making it suitable for large-scale production. However, sandalwood proved to be a promising natural alternative with good formulation stability and acceptable pH levels.

Methodology

Formulation → Evaporation Test → pH Test → Stability Test → Cost Analysis



Formulation

Component	Formulation 1	Formulation 2	Control
Rambutan Essential Oil (mL)	1.5	1.5	1.75
Cucumber Essential Oil (mL)	1.0	1.0	1.25
Fixative (mL)	0.5 (Sandalwood)	0.5 (Ambroxan)	-
Polysorbate-20 (mL)	3.0	3.0	3.0
Dipropylene Glycol (mL)	2.5	2.5	2.5
Distilled Water (mL)	1.5	1.5	1.5
95% Denatured Alcohol (mL)	40.0	40.0	40.0

pH Test

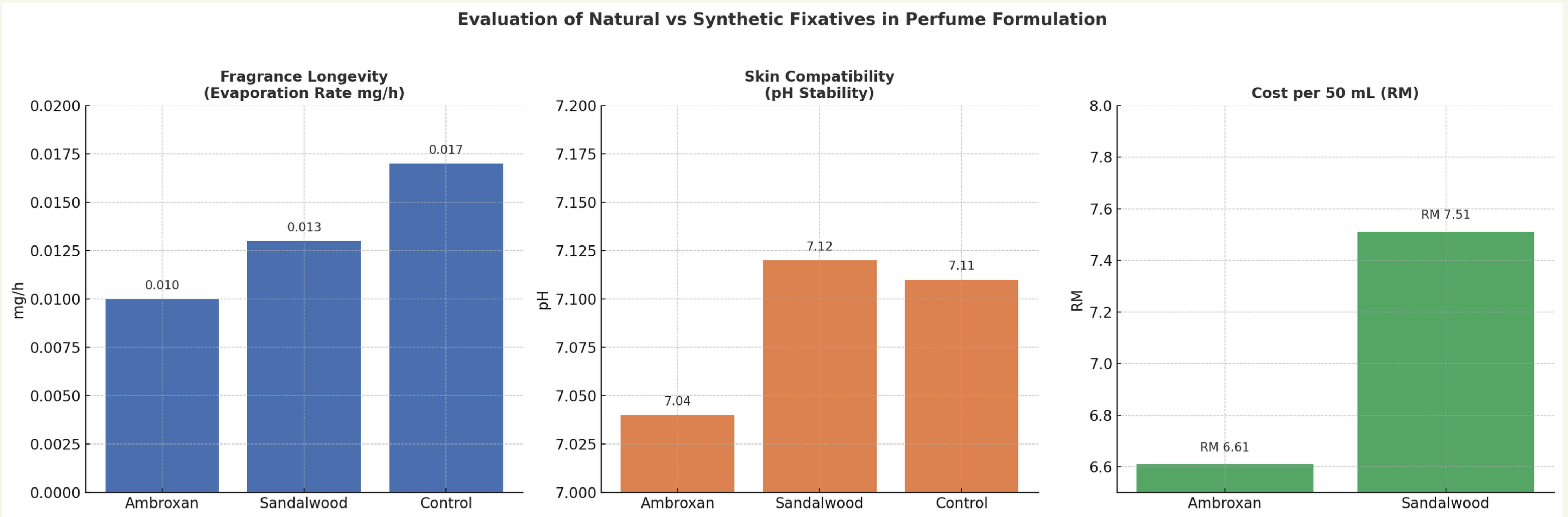
To ensure skin safety, pH was tested using both pH strips and a digital pH meter. While the strips showed flat readings of 5.00, the digital meter detected subtle but consistent differences, with Ambroxan samples having the lowest pH (7.04), sandalwood the highest (7.12), and the control in between (7.11).

Stability Test

The formulations were tested under different storage conditions at room temperature (27°C), high temperature (50°C), and cold storage (4°C) for 14 days. All samples remained clear, homogeneous, and free of phase separation or discoloration, indicating strong formulation stability.

Cost Analysis

A cost comparison was performed using the price per 50 mL of each formulation. Sandalwood EO-based perfume cost RM 7.51, while Ambroxan-based perfume cost RM 6.61, showing a 13.6% difference largely due to the higher price of natural fixatives.



- Evaporation Rate (mg/h): Ambroxan lasts longest (lowest rate).
- pH Stability: All within safe range (7.0–7.2).
- Cost per 50 mL: Ambroxan is cheaper (RM 6.61 vs. Sandalwood RM 7.51).

Conclusions

This study tackled the problem of improving fragrance longevity in a cost-effective and skin-friendly way by comparing two widely used fixatives: sandalwood essential oil and Ambroxan. Ambroxan emerged as the more efficient fixative, offering the slowest evaporation rate, good pH stability, and greater cost-effectiveness. Meanwhile, sandalwood performed well overall and proved to be a reliable natural option. What makes this study valuable is its practical, data-backed insights, which can guide perfumers and formulators in choosing the right fixatives based on their priorities — whether that is longevity, cost, or natural sourcing.

Future Work

Future research could expand by testing a wider range of natural and synthetic fixatives, exploring fixative combinations, and evaluating performance on actual skin under different climates. This would provide deeper insight into how perfumes behave in real-life conditions.

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