The effect of pre-treatments on the yield and quality of volatile oil from different plant parts of agarwood

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Abstract

Agarwood and its essential oil are commodities with great commercial value owing to its aromatic and excellent medicinal worth. Due to the global demand for agarwood essential oil, it is significant to conduct further studies and research on the extraction methods to enhance production efficiency. Solvent extraction is a conventional method commonly used to extract the volatile compounds of agarwood chips as it is economical and easy to construct. However, the extracted essential oil yield is relatively low. Therefore, a pre-treatment technique is crucial before the extraction process to maximize the percentage yield of essential oil from agarwood chips. This research aimed to examine different pre-treatment techniques to improve the efficiency of oil extraction from different plant parts: the cortex, IP-XR zone and, pith by soaking with enzymes (*A.niger*), acid (H_2SO_4), and a combination of enzyme (*A.niger*) and acid (H_2SO_4). The extracts produced were compared with the control group (without pre-treatment). The sample treated with acid has the highest average oil extract (6.92g) compared to combination pre-treatment (3.23g), enzymatic (1.51g), and the control (0.70g). IP-XR zone gave the highest oil yield (4.98g) compared to the cortex(3.26g) and pith (1.04g).

Methodology

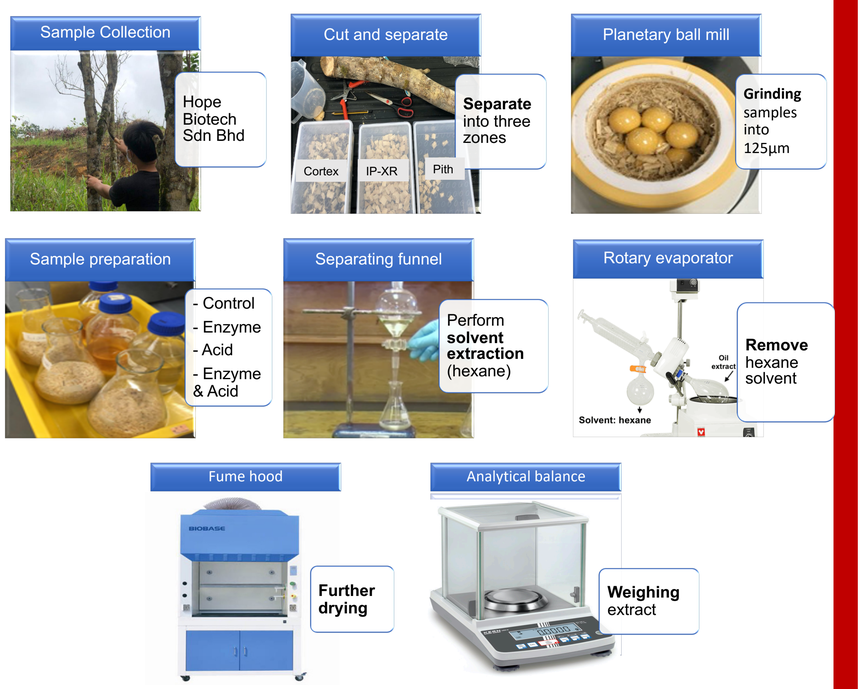

Figure 1: Methodology

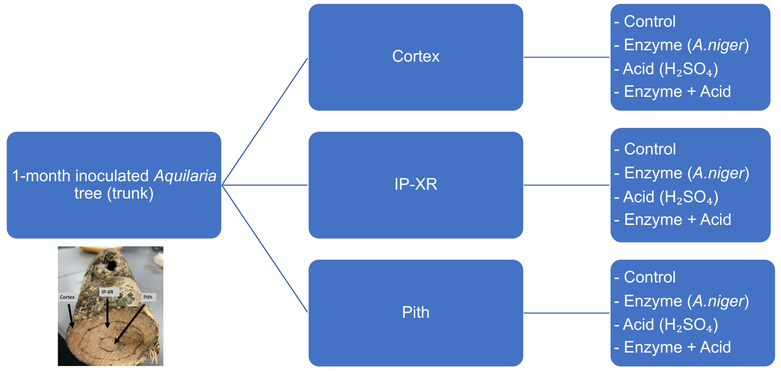

Figure 2: Experimental set-up

Results & Discussions

Table 1: Data test points collected

Group	Zone	Oil yield (g)	Average oil yield (g)
Control	Cortex	0.73	0.70
	IP-XR	1.34	
	Pith	0.03	
Enzymatic pre-treatment (*A.niger*)	Cortex	1.47	1.51
	IP-XR	2.97	
	Pith	0.10	
Acidic pre-treatment (H_2SO_4)	Cortex	7.30	6.92
	IP-XR	9.64	
	Pith	3.83	
Enzymatic + Acidic pretreatment	Cortex	3.53	3.23
	IP-XR	5.95	
	Pith	0.20	

- Comparatively, acidic pre-treatment produced the maximum oil yield with an average of 6.92g, followed by combination pre-treatment, enzymatic pre-treatment, and the control which are 3.23g, 1.51g and 0.70g, respectively. Accordingly, acidic pre-treatment has resulted in optimum cellular cell wall breakage enabling the highest oil extraction whereas combination pre-treatment might had caused excessive corroding of agarwood chips cell wall which eventually released the essential compounds of agarwood chips into the soaking medium (Jok et al. 2016) resulting in lower oil yield compared to acidic pre-treatment. Enzymatic pre-treatment has the lowest oil yield probably due to insufficient cellular wall breakage as the amount of oil yield is dependent on the cellular contents (Abdul Rahim, Kadri & Harun 2019).

- Comparatively, IP-XR zone has shown the highest oil yield in all the pre-treatments indicating that this zone has the highest concentration of agarwood resins.

Conclusion

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- From the above study, all pre-treatments have shown improved extraction efficiency, indicating that the application of pre-treatments can enhance the oil yield by degrading the agarwood chips cell wall before oil extraction. Further studies are required to improve on the methodology process to obtain optimum cell wall breakage to enable maximum essential oil quality and yield extraction, thus ensuring a sustainable way of essential oil supply to meet global demand.

Further work

- For medicinal value, preliminary assay on different plant parts will be conducted on the total phenolic and flavonoid content to determine the antioxidant activities using ABTS assay and DPPH assay.

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References

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