# The Effect of Incubation Time on Biotransformation of Gurjun Balsam Oil by *Aspergillus niger*

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## ABSTRACT

Gurjun balsam oil is one of the essential oils from Indonesia which is isolated from the resin plant *Dipterocarpus turbinatus*. The main content of gurjun balsam oil is a copaene compound and several other sesquiterpenes class compounds. In this research, biotransformation of the compound content of gurjun balsam oil with *Aspergillus niger* was carried out. The biotransformation process was carried out at room temperature with a speed of 130 rpm and a variation of the incubation time of 24, 48, 72, and 96 hours. The biotransformed products were analyzed by GC-MS. The main products formed from the biotransformation of gurjun balsam oil were copaene (60.53%, 72 h), beta-caryophyllene (24.14%, 96 h), humulene (3,74%, 48 h), and alpha-cadinene (13.74%, 48 h). The optimum incubation time with the highest copaene product was 72 hours. Based on these results, it can be concluded that *Aspergillus niger* can increase the yield of copaene compounds in gurjun balsam oil.

**Keywords:**biotransformation, gurjun balsam oil,*Aspergillus niger*, and copaene

## INTRODUCTION

Gurjun oil is used as a fixative and traditional medicinal ingredient [1]. Research on the exploration of gurjun oil as a medicinal raw material and its mechanisms has not been widely reported. The α-copaena compound which is the major compound in gurjun oil is included in the tricyclic sesquiterpene group (Fig.1). The yield of compound α-copaena be indicators of the quality of gurjun balsam oil. Increasing the yield of α-copaena compounds in gurjun oil can be done by biotransformation using *A. niger*. The existence of a carbon skeleton in the terpenoid group structure can be a source of substrate for *A. niger* [2].

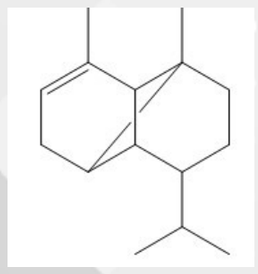
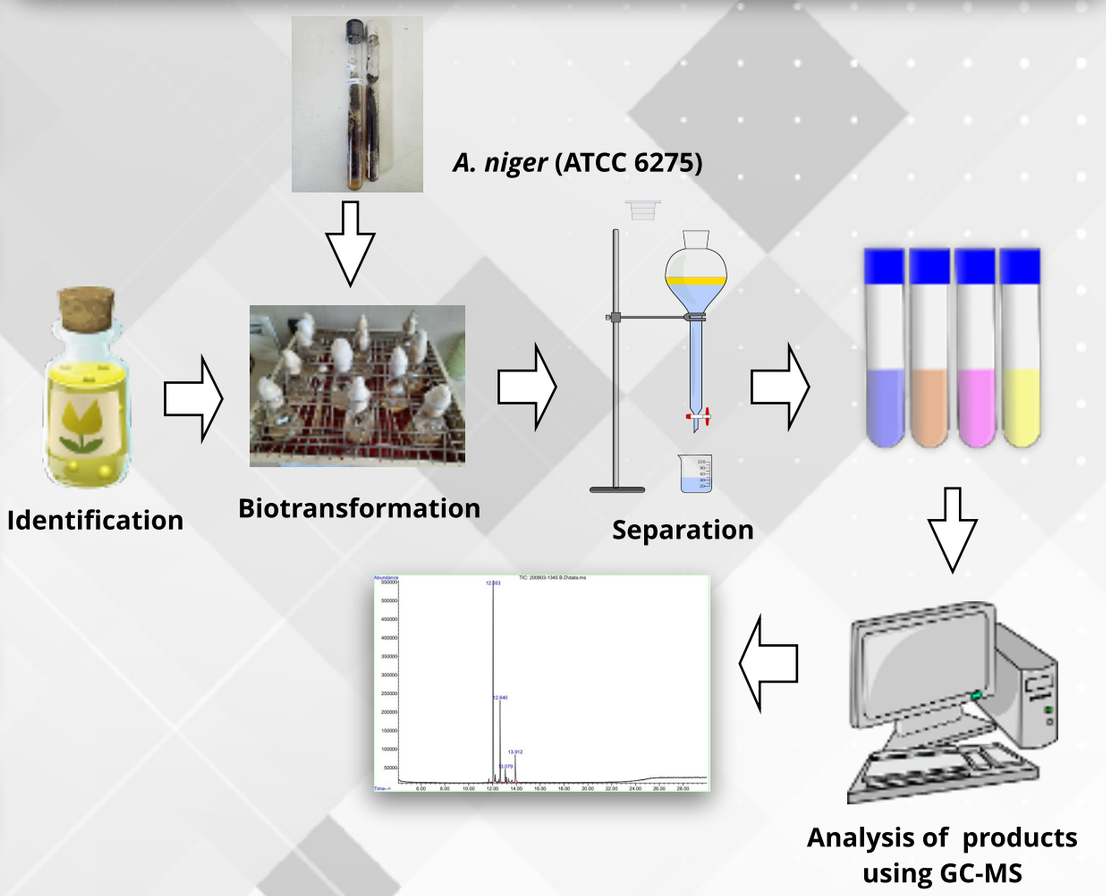


**Fig.1** α-copaena

## METHOD




## RESULT

The balsam gurjun oil used as research material contains α-cubebene (1.54%), α-copaene (49.05%), beta-cubebene (3.4%), α-gurjunene (1.21%), β-caryophyllene ( 20.46%), humulene (4.57%), aromandendrene (1.8%), y-muurolene (2.16%), naphthalene (2.77%), and α-cadinene (13.06%). The products of biotransformation of gurjun oil with A. niger include α-copaene, β-karyophylene, humulene, and α-cadinene.

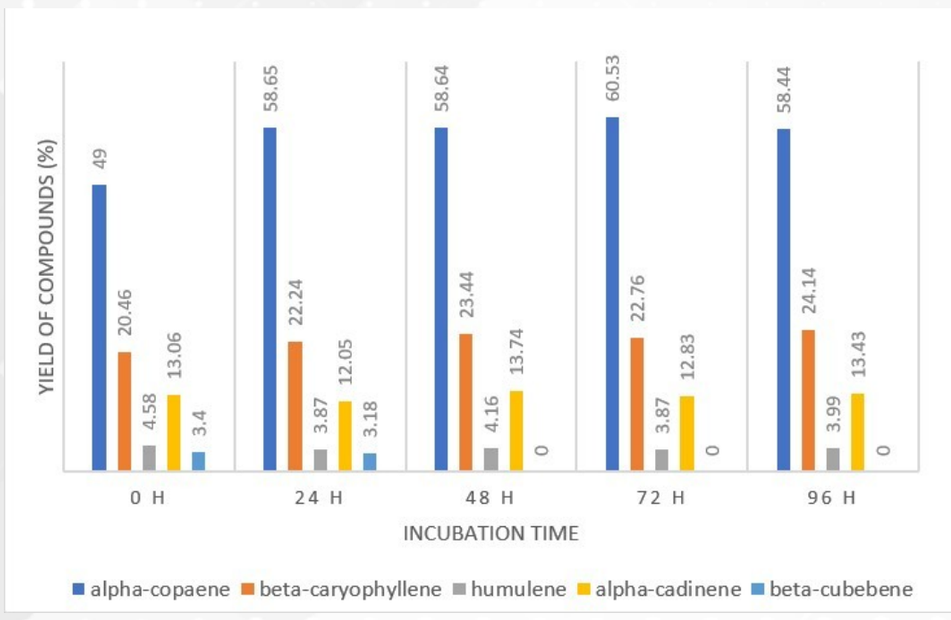



**Fig.2** The yield of biotransformation product by A. niger

Chromatogram data of biotransformation products showed an increase in yield of α-copaene from 0 h to 72 h of incubation time. Minor compounds in balsam gurjun oil are the substrate for A. niger. The extracellular enzyme A. niger causes the transformation of β-cubebene to α-copaena at the incubation time of 48 h. The presumed reaction mechanism is the 1,3 sigmatropic rearrangement and dealkylation reaction.


## CONCLUSION

The optimum incubation time of gurjun oil biotransformation is 72 h and Gurjun oil biotransformation with A. niger does not produce new derivatives, but increases the yield of α-copaene compounds.

## REFERENCES

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[2] I. A. Parshikov and J. B. Sutherland, "The use of Aspergillus niger cultures for biotransformation of terpenoids,"*Process Biochem.*, vol. 49, no. 12, pp. 2086–2100, 2014.