

Biotransformation of Fatty Acids by *Pseudomonas* sp. Strain SS 22

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Introduction

Fatty acids are the main constituents of lipids (Brock *et al.*, 1994). Fatty acids have interesting chemical properties because they contain both highly hydrophobic and hydrophilic regions. The chemical properties of lipids make them ideal structural components of membranes. Industrial microbiology is the discipline that uses microorganisms to produce valuable commercial products or carry out selective and specific chemical transformations. The use of microorganisms for this purpose is called "Biotransformations". Microbial transformation has been widely exploited in the preparation of value-added products. The reactions include hydrocarbon degradation (Sannasi *et al.*, 1998) and fermentation, crude oil degradation (Razak *et al.*, 1999; Ali *et al.*, 1998), coal desulfurisation and bioremediation of oil (Salleh *et al.*, 1996) and chemical spills. Likewise, Razak *et al.* (1996) had successfully isolated an *Acinetobacter anthraxis*, which was able to transform oleic acid, stearic acid, coconut oil and olive oil to specialized compounds. Biotransformations of fatty acids have been reported to produce desired products which of high commercial value by Lanser & Manthey (1999) and Koritala *et al.*, (1987). El-Sharkawy (1992) also reported that biotransformation of fatty acids were capable of producing particular metabolites specifically used as additives, lubricants and surfactants.

Materials and Methods

Isolation and Screening: Samples of soils and oil palms were screened in minimal media containing hydrocarbon compounds as the sole carbon source.

Biotransformation Studies: Transformation of fatty acids to new products were analyzed by TLC, GC, FTIR and GC-MS.

Results and Discussion

Pseudomonas sp. (strain SS 22) is a Gram negative, coccoid-rod, aerobic and nonsporing bacteria. This strain was isolated from oxidation pond of palm oil mill, Ulu Langat, Selangor. Based on TLC, GC, FTIR and GC-MS analysis, the strain was able to assimilate both unsaturated and saturated fatty acids as the carbon source and transformed them to new products after 7 days (Shafiei *et al.*, 1999). However, the result showed that strain SS 22 has a greater preference to transform short chain saturated fatty acid compared to the unsaturated fatty acid to produce valuable products. The biotransformation trend in decreasing order is as follows: lauric > myristic > oleic > linoleic > palmitic > stearic acids. Results from FTIR showed that the biotransformation products are compounds containing amide or/and ketone or/and carboxylic acid for saturated fatty acids and ester or carboxylic acid for unsaturated fatty acids. GC-MS results confirmed that the valuable products from lauric and myristic acids are 9-octadecanoic and 9-octadecenamide, whereas hydrocarbon products produced like palmitic and stearic acids, 9-hexadecenoic acid and cis-11-octadecenoic methyl ester or 9-octadecenoic methyl ester have been produced from oleic and linoleic acids.

Conclusions

Valuable products from lauric and myristic acids like 9-octadecanoic and 9-octadecenamide and hydrocarbon products like palmitic and stearic acids have been successfully produced by *Pseudomonas* sp SS 22. Whereas, 9-hexadecenoic acid and cis-11-octadecenoic methyl ester or 9-octadecenoic methyl ester have been successfully transformed from oleic and linoleic acids.

Benefits from the study

Biotransformation of fatty acids by *Pseudomonas* sp. strain SS 22 can be exploited to produce valuable products with high commercial value.

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