



A process for preparation of para-menthane-3,8- diols enriched citronella oil

TECHNOLOGY AVAILABLE FOR TRANSFER

UNMET NEED AND OPPORTUNITY

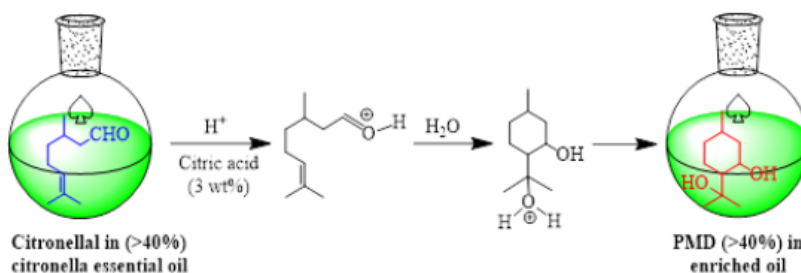
p-Menthane-3,8-diol (PMD), also known as para-menthane-3,8-diol or menthoglycol, is gaining attention as a potent alternative to *N,N*-diethyl-methyl benzamide (DEET) due to its similar efficacy. PMD occurs naturally in small amounts (1–2%) in the essential oil from *Corymbia citriodora* (formerly *Eucalyptus citriodora*). The *cis*-isomer of PMD, which has a menthol-like aroma and cooling effect, is more effective as an insect repellent than the *trans*-isomer. However, the natural *cis*-isomer is expensive due to its limited occurrence, and the cultivation of *C. citriodora* is discouraged due to environmental concerns.

Among botanical repellents, java citronella (*Cymbopogon winterianus*) oil is commonly used as an insect repellent due to its efficacy and low toxicity. However, its high volatility and requiring frequent reapplication which can cause allergic skin reactions limits its effectiveness. There is a need for an environmentally friendly, biodegradable, and effective insect repellent ingredient. No prior efforts have been made to use citronella foliage essential oil as a substrate for such development.

The current innovative technology offers a process to enhance the mosquito and insect repellent properties of low-value citronella essential oil by enriching it with PMD. This process predominantly yields the *cis*-isomer (~86%) of PMD through an *in situ* chemical transformation using a mild organic acid medium. The resulting oil preparation demonstrates slow evaporation, providing long-lasting insect repellent action.

TECHNOLOGY

- The process for preparation of para-menthane-3,8-diols enriched citronella oil, comprising of (a) adding an oil phase comprising citronella oil to an aqueous phase comprising an



- organic acid to obtain a mixture; and (b) heating the mixture at a temperature in the range of 55 to 85°C to obtain para-menthane-3,8-diols enriched citronella oil.
- The process further comprises quenching to separate the organic phase from the aqueous phase and the organic phase is further dried over a drying agent.
- The technology also provides an insect repellent composition comprising: (a) para-menthane-3,8-diols enriched citronella oil and additives.

STAGE OF DEVELOPMENT

TRL-5.



UNIQUE SELLING PROPOSITIONS

- **Quality-** Biocompatible, biodegradable and non-toxic. Currently no such product is available in market.
- **Enhanced efficacy-** Long lasting protection from Mosquitoes and insects.
- **Shelf life-** Stable at room temperature
- **Cost effective-** Cost effective due to simple method of preparation.
- **Ease of use-** Miscible in oils, cream, lotions and alcoholic solutions.

The European Union has authorized the use of PMD under their Biocidal Product Regulation (BPR Regulation (EU) 528/2012) which is aimed at protecting humans, animals, materials, or articles against harmful organisms such as insects, pests, or bacteria through the active substances contained in the biocidal product. Similarly, the United States Environmental Protection Agency (EPA) has also authorized the use of PMD. The products currently available in the international market are significantly expensive i.e Rs. 4000/- per 4 fluid ounces (amounting to Rs. 34,000/kg) compared to present PMD technology which costs only Rs. 2500/kg. This offers a significant opportunity for export of products made using the current PMD technology. The repellent activity of product by using this PMD technology is even more powerful than pure PMD due to synergistic effect of citronella biogenic volatiles.

APPLICATION

- **Development of products for indoor activity**
 - Mosquito/bugs repellent spray and cream/lotions
 - Ant/cockroach/termite/cricket repellent spray
 - Floor cleaners
- **Development of products for outdoor activity**
 - Fabric roll on
 - Plant feeding insects repellent spray
 - Mosquito/bugs repellent spray and cream/lotions for farmers

INTELLECTUAL PROPERTY

Indian patent filed

LICENSING OPPORTUNITY

BCIL is looking for suitable Licensees for transfer of this technology.

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