NATURAL ANTI-PARASIDIC AND ANTI-MICROBIAL INGREDIENTS SOLUBILIZED BY A NATURAL SOLUBILIZER FOR CONVENTIONAL AND ORGANIC AQUACULTURE APPLICATIONS

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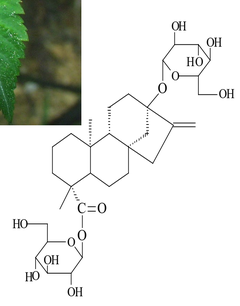
The Demand

- Many essential oils are anti-parasitic and anti-microbial.
- Tea Tree Essential Oil (TTEO) and Clove Bud Essential Oil (CBEO) are two.
- However, oils do not disperse in water.
- Enhancing solubility enables dispersion and access to pathogens.

The Problems and Solutions

- Active ingredients (ai) are often discovered involving DMSO or ethanol.
- Translating to real-world applications are harder after removing organic solvents.
- Replacing them with naturally occurring compounds to act as solubilizers creates viable solutions.
- Steviol glycosides (SG) isolated from plants of *Rubus suavissimus* and *Stevia rebaudiana* are some (Fig. 1).
- SG forms micelles in water.



Rubusoside

The structure of rubusoside, one of the steviol glycosides (SG) found in the plant *Rubus suavissimus* and *Stevia rebaudiana*.

The Method

- Load essential oils in the SG micelles.
- Disperse the loaded SG micelles in water.
- Create concentrations that are effective against bacterial pathogens.
- Maintain physical and chemical stability of the loaded micelles for extended treatment windows.

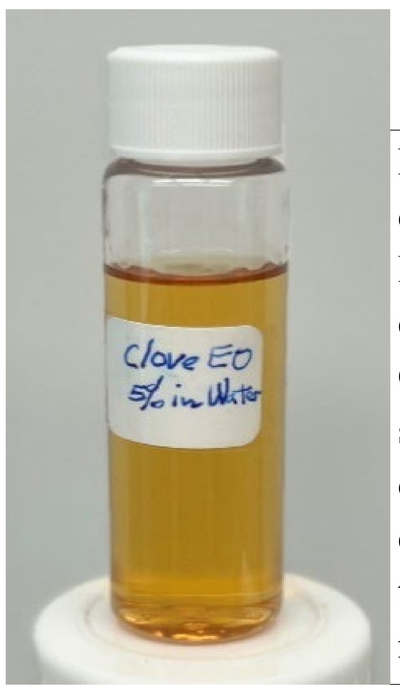


Figure 2. Water-dispersible Clove Bud Essential Oil (CBEO) concentrate enabled by a GRAS botanical solubilizer. It is freely dilutable without losing clarity. CBEO is one of the most potent anti-microbial essential oils.

The significance

Rubusoside dispersed essential oil compounds in water. Anti-parasitic and anti-microbial properties are maintained in the micelles. Overcoming poor solubility enables accurate aquatic studies and seamless transition to efficacy and toxicity applications. Being a GRAS is ideal for food and organic aquaculture.

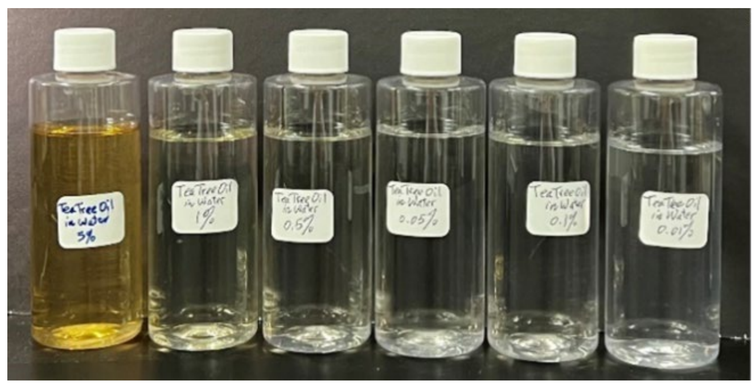


Fig. 2. Water-dispersible Tea Tree Essential Oil (TTEO) concentrate and its dilutions enabled by a botanical solubilizer. They were stable and free from organic solvents, emulsifiers, or chemical preservatives.

The Impacts

- TTEO and CBEO were each dispersed to a 5% concentrate (Fig. 2 and 3).
- Dilutable to as low as 0.01% without losing clarity (Fig. 2).
- The wide range of clear dilutions from 50,000 ppm to 100 ppm allows accurate dosing design for achieving anti-parasitic and anti-microbial efficacy.
- CBTO was 10-fold more potent than TTEO for anti-microbial uses.
- The two concentrates are freely miscible, enabling combination of terpene and phenolic classes.
- The solubilizer is generally regarded as safe (GRAS) by the US FDA.
- Clean-label products can be built by using water-dispersible TTEO and CBEO ingredients.
- Immersion in TTEO at 40 ppm (0.004%), for example, was reported effective against the parasitic Dactylogyrus spp.
- Both the concentrate and its dilutions were stable physically (no separation), chemically (no degradation), physiologically (across pH from 1.8 to 8), and biologically (no microbial growth).
- Obtaining samples for evaluation toward collaborative development is open.