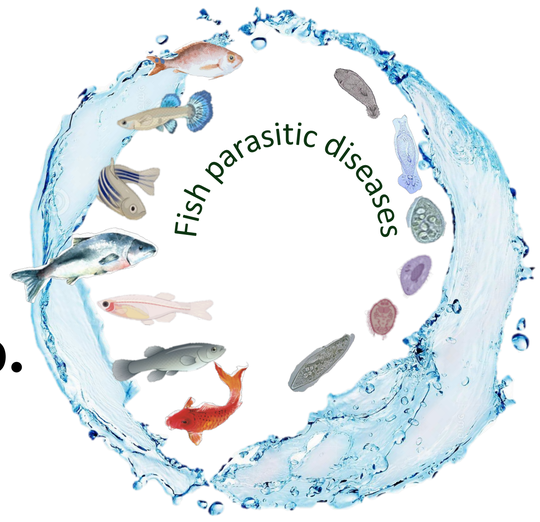
FATTY ACID ETHYL ESTERS FROM COCONUT OIL AND BLACK SOLDIER FLY LARVAE FOR SUSTAINABLE TREATMENT AGAINST *Gyrodactylus turnbulli* AND *Trichodina* sp.



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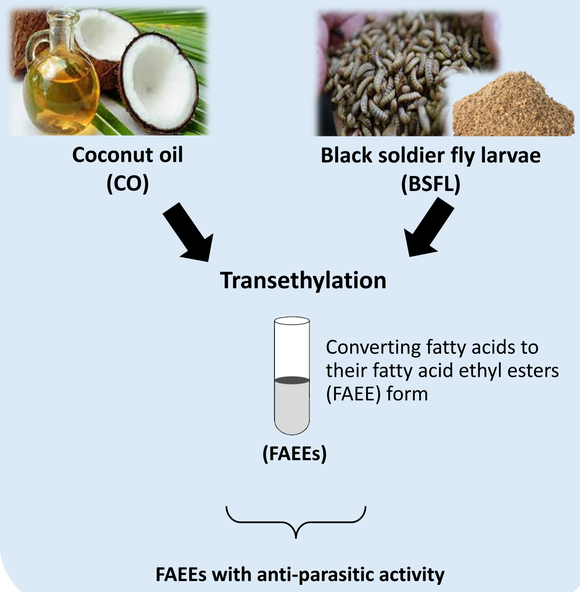
INTRODUCTION

- Parasites are ubiquitous in aquaculture and can have devastating effect with serious socioeconomic, ecological, and welfare consequences.
- Treatment against parasitic diseases involves the use of toxic chemicals, and for some parasites, no effective and permitted treatment is available (such as for monogenea).
- Fatty acid ethyl esters (FAEEs) preparation from the photosynthetic marine diatom *Phaeodactylum tricornutum* was effective against fish monogenean parasites (Jawaji et al., 2023)
- Screening a range of FAEEs revealed that C 12:0, ethyl laurate, was the most effective (Jawaji et al., 2024).

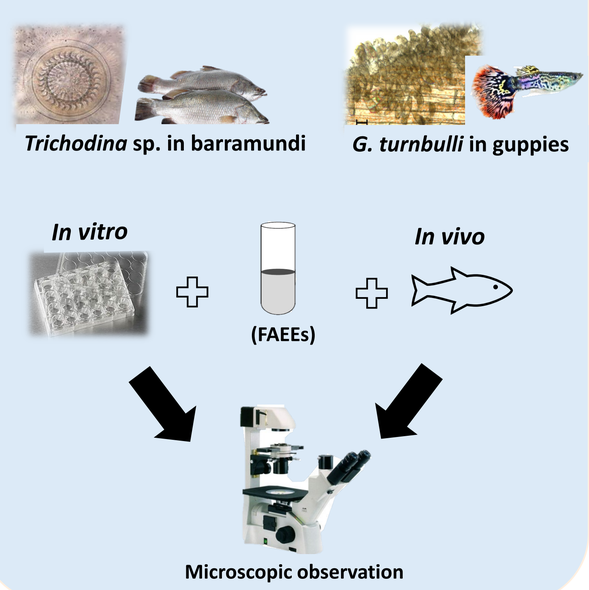
Our aim - was to utilize C 12:0-rich natural sources, coconut oil (CO) and black soldier fly larvae (BSFL) for developing natural therapeutant against the fish parasites.

MATERIALS AND METHODS

1. Fatty acid ethyl esters (FAEE) preparations



2. Antiparasitic activity (*in vitro* followed by *in vivo* trials)



- A broad range of commercial FAEEs was investigated against *G. turnbulli* and *Trichodina* sp., monogenean and protozoan parasites of fish.
- FAEEs preparations from natural sources and waste material were analyzed.

RESULTS

1. Testing commercial FAEEs (Ex-vivo and in-vitro)

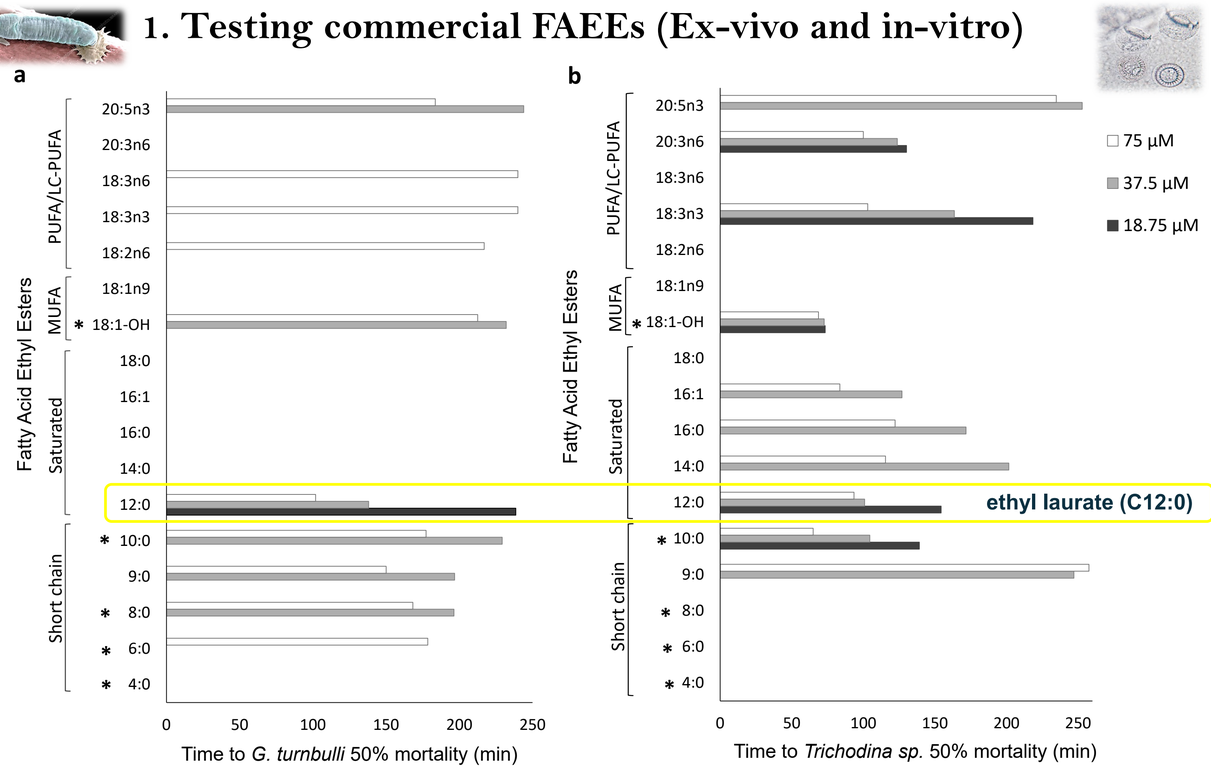


Fig 1. Antiparasitic effect of commercial FAEEs against *G. turnbulli* (a) and *Trichodina* sp. (b). Parasites were observed for mortality over 240 min; n = 3 wells with 3–5 *G. turnbulli* or 10–20 *Trichodina* sp. per well. LC-PUFA, long-chain polyunsaturated fatty acids; MUFA, monounsaturated fatty acid. * **indicates toxicity to fish at the effective concentrations** (Jawaji et al., 2024).

3. In vivo antiparasitic effect of FAEEs preparation from CO and BSFL against *G. turnbulli*

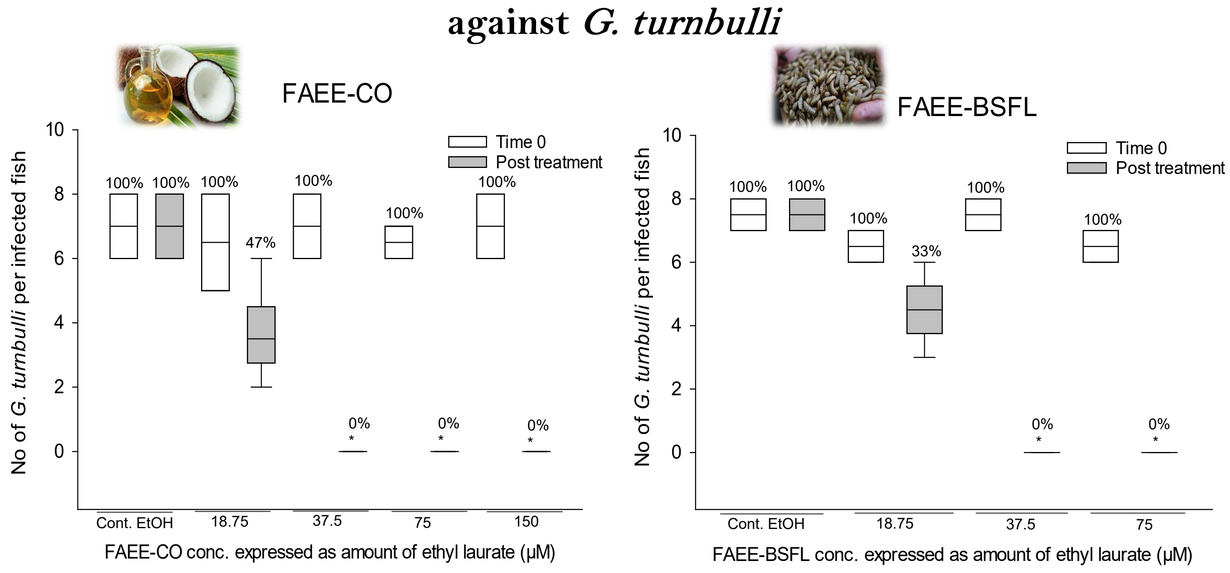


Fig 3. In vivo antiparasitic effect tested in guppies infected with *G. turnbulli*

2. Antiparasitic effect of ethyl laurate, FAEEs preparation from CO and BSFL against *G. turnbulli*

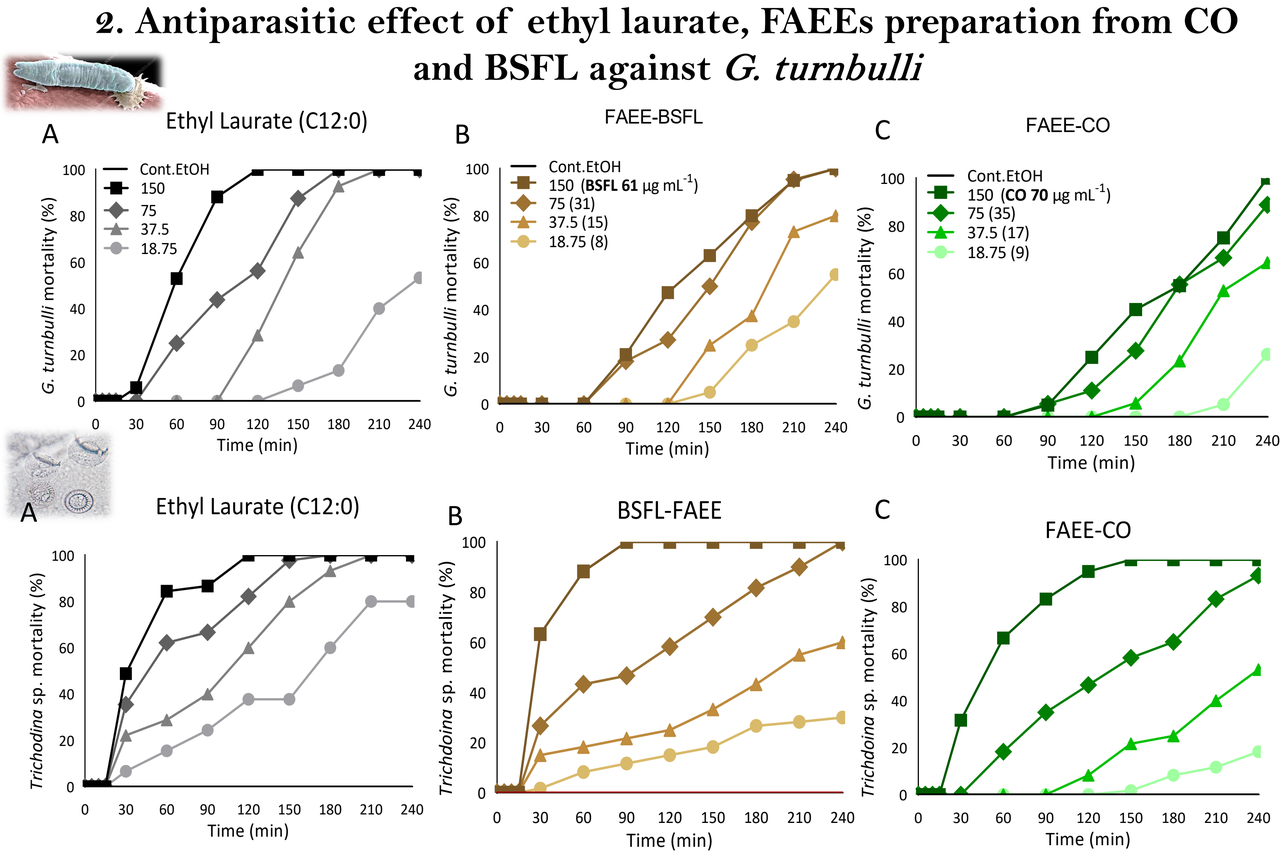


Fig 2. Ex vivo antiparasitic effect of (A) commercial ethyl laurate (C12:0); (B) BSFL-derived FAEEs; (C) coconut oil CO derived FAEEs against *G. turnbulli* (top) and *Trichodina* sp. (bottom). The food-grade detergent Kolliphor (K) and sonication (S) were added to improve solubility. Ethanol (the solvent) served as control. The concentrations correspond to the ethyl laurate content, in µM (the amount of CO or BSFL required for each concentration).

CONCLUSIONS

- Of the tested FAEEs, ethyl laurate (C12:0) emerged as non-toxic to fish, and effective against *G. turnbulli* and *Trichodina* sp. infection in fish.
- The lauric acid-rich CO and BSFL-based preparations were shown to be effective for fish parasite control, as demonstrated in vitro (Fig 2) and in vivo (Fig 3).
- The effectiveness of FAEE preparations correlated with the ethyl laurate content

ACKNOWLEDGMENT

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REFERENCE

Jawaji, A., Zilberg, D., & Khozin-Goldberg, I. (2023). Using byproduct of fucoxanthin production by Phaeodactylum tricornutum for the development of a treatment against monogenean infection in fish. Journal of Applied Phycology, 35(6), 2719-2730.

Jawaji, A., Goldberg, I. K., & Zilberg, D. (2024). Exploring the use of fatty acid ethyl esters as a potential natural solution for the treatment of fish parasitic diseases. Journal of Fish Diseases, e13991.