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DETECTION AND CONTROL OF PREDATORS IN MICROALGAL CULTURES

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Motivation

- Microalgae produce an interesting biomass for the production of food, animal feed, biofuels and bulk chemicals[1]
- Currently, production of microalgae is rapidly moving from lab-scale to full-scale production facilities
- Cultivation systems suffer from unforeseen losses in productivity due to the invasion of cultures by predators[2]

→ **Need for effective crop control strategies**

Research goals

I Determine the factors that influence the invasion success of a predator

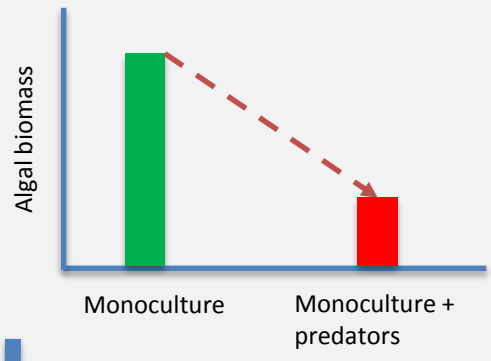
II Study whether volatile compounds can be detected using SIFT-MS and used as a warning system for predators

III Introduce a top-predator to biologically control predators of microalgae (trophic cascade)

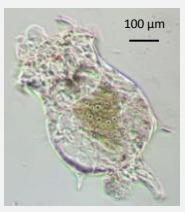
IV Explore the potential of using natural pesticides (i.e. feeding deterrents) to control predators

I – Study Invasion success of predators

- Predator species (growth rate, feeding mode…)
- Microalgae species/strain
- Culture conditions (nutrient supply, cell density…)



Microalgal predators



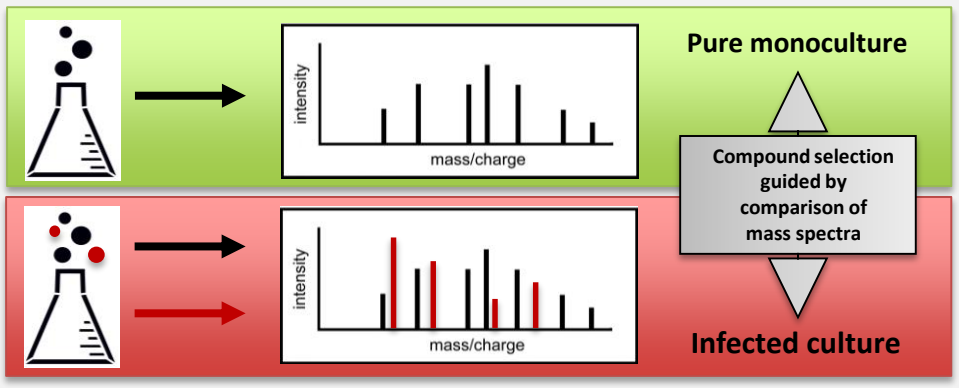
Brachionus sp.



Oxytricha sp.

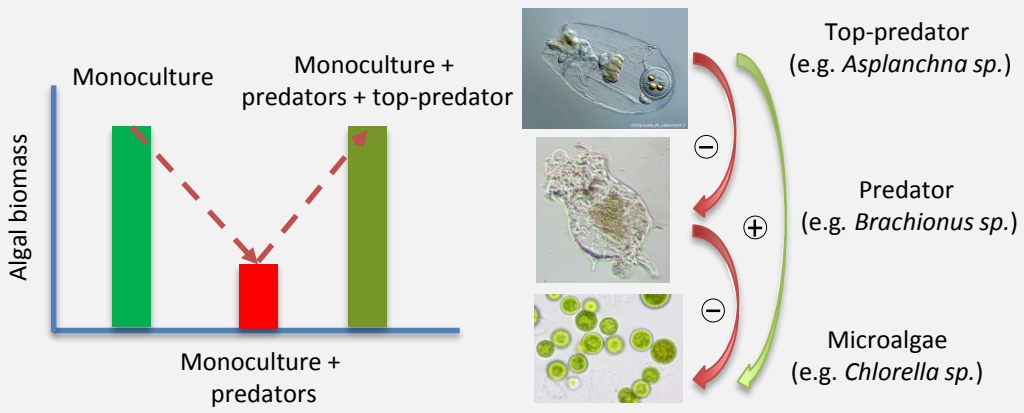
II – Detect and monitor predator presence

- Selected Ion Flow Tube Mass Spectrometry (SIFT-MS) to screen for specific volatile organic components (VOCs) that are released upon predation



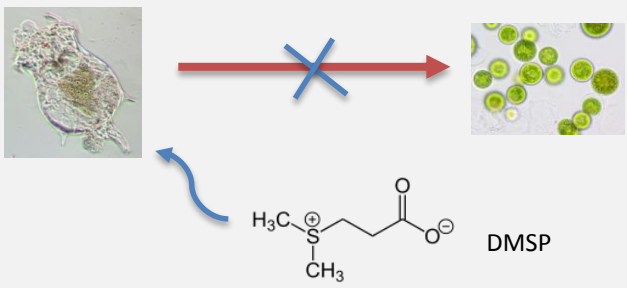
III – Biocontrol of predators using a trophic cascade

- Introduction of a top-predator (predatory rotifers/ciliates or copepods)
- Currently successful in conventional horticulture



IV – Control of predators using natural pesticides

- Feeding deterrents (FDs) serve as a natural pesticides that inhibit predator feeding
- FDs are less likely to evolve resistance
- E.g. dimethysulfoniopropionate (DMSP)[3], polyunsaturated aldehydes, amino acids…



References:

[1] Mata, T.M., Martins, A. a., Caetano, N.S., 2010. Microalgae for biodiesel production and other applications: A review. Renew. Sustain. Energy Rev. 14, 217–232.

[2] McBride, R.C., Lopez, S., Meenach, C., Burnett, M., Lee, P. a., Nohilly, F., Behnke, C., 2014. Contamination Management in Low Cost Open Algae Ponds for Biofuels Production. Ind. Biotechnol. 10, 221–227.

[3] Strom, S., Wolfe, G., Slajer, A., Lambert, S., Clough, J., 2003. Chemical defense in the microplankton II: Inhibition of protist feeding by ß-dimethylsulfoniopropionate (DMSP). Limnol. Oceanogr. 48, 230–237.