

An Indian-Australian research partnership

Project Title: Strategies to control grazer growth in algal cultures

Project Number IMURA0303



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Research Academy Themes:

Highlight which of the Academy's Theme(s) this project will address?

(Feel free to nominate more than one. For more information, see www.iitbmonash.org)

1. Advanced computational engineering, simulation and manufacture
2. Infrastructure Engineering
3. **Clean Energy**
4. Water
5. Nanotechnology
6. **Biotechnology and Stem Cell Research**

The research problem

Define the problem

Algae are increasingly considered as an important source for large scale production of biodiesel. Cultivation of algae in an open environment is often hampered by predation by aquatic invertebrates and protozoa, generally referred to as grazers. Control of grazer growth in open ponds is thought to be the major challenge in the field. The influence of environmental parameters on the relative growth behaviors of microalgal cultures and grazers is poorly understood, and hence this research problem proposes to systematically identify and evaluate various grazer control strategies. The project involves the investigation of the differential impacts of various environmental parameters on a micro-algal strain of interest, and on selected grazers, and identifying stresses to which grazers are especially sensitive. Investigations will employ transcriptomic and proteomic approaches. The impact of algal toxins on grazers will also be evaluated; promising growth control candidates will subsequently be genetically engineered into the algae".

Project aims

Define the aims of the project

- Understanding algal growth and product formation, in the presence of different grazers.
- Evaluating different physical and biochemical stress agents for their differential impact on algae/grazer growth and on product formation.
- Identification of specific transcripts and translated products from the transcriptomics and proteomics studies.
- Development of recombinant algal systems for expression of peptide-based grazer control.

Expected outcomes

Highlight the expected outcomes of the project

Specific environmental parameters and protein(s) identified to control growth of grazers.

How will the project address the Goals of the above Themes?

Describe how the project will address the goals of one or more of the 6 Themes listed above.

The project will address the critical questions on controlling grazer growth in algal culture and identify relevant solutions.

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

- M.Sc., or M.Tech Biochemistry or Biotechnology or equivalent. Project-related experience with biochemistry, microbiology and molecular biology techniques would be an advantage.
- Basic chemistry at level 1 would be required.
- Biochemistry, Biotechnology, Masters would be desirable.
- Work experience with algae is desirable.

Additional costs and equipment

Describe below additional costs that would be needed to complete this project. This would typically include project-related costs (such as consumables). Computers, desks, conference travel, student travel to Australia, etc should not be included here. They are already provided for. Anything over a few thousand dollars per year will need reasonable justification (either here below or in a spreadsheet for much larger amounts). Such requests will be considered by a separate committee which will consider history of collaborations, track record and then sometimes only agree to seed-funding the project.

All these project a high level of dedicated high speed computing infrastructure at Monash (where all simulation work will be carried out).

Approx. cost for high performance computing platform: A\$20k (Across the 3 Reliance Projects)

At IITB, consumable costs would include chemicals for sample processing, molecular biology reagents, kits and reagents for the transcriptomics analysis. Additionally, we would like to correlate the transcriptomics findings with proteomics analysis.

Consumable costs (CON) will be Rs. 15 lakhs – year 1; Rs. 15 lakhs – year 2; Rs. 8 lakhs – year 3 and; Rs. 8 lakhs – year 4.

Contingency (CCT) will be Rs.2.5 lakhs–year 1; Rs. 1.5 lakhs -year 2; Rs. 1.5 lakhs – year3; Rs. 1.5 lakhs--year 4.

CON – it would include chemicals for the sample processing, molecular biology reagents, kits and reagents for the transcriptomic and proteomic analysis.

CCT – it would include cost for any outsourcing services, equipment maintenance fees and some traveling funds.