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PROJEKTINSPIRATION FÖR GYMNASIEARBETET

1 SEED RAIN IN NORTHERN MOUNTAINS – VARIATION AMONG YEARS RELATED TO CLIMATE REGIMES

Klimat, miljö, biologi, terrestrisk ekologi

Projektidé från **Göteborgs Universitet**

INTRODUKTION

Within the ITEX (International Tundra Experiment) network, several side projects have been initiated at many of the field stations across the pan-arctic tundra. At the Latnjajaure site in northernmost Swedish Lapland, we are focusing on various aspects of the cryosphere in relation to climate change impacts. Therefore, we are not only dealing with the highly specialized plant communities in topographic depressions (snowbeds), but also, more interestingly, how these plants are connected within a landscape matrix. We have deployed seed traps in open tundra (with less snow cover) as well as in snowbeds, and all these samples are now available for analysis. For identifying species from seed morphology, we have an extensive reference collection at BioEnv. The overarching science questions for this project is if variation in seed rain among years is related to climate regimes. This project can be done any time of the year!

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KÄLLOR/MATERIAL

- https://science.gu.se/forskning
- https://gmv.gu.se/Aktuellt/nyheter/Nyheter+Detalj//arktis-blir-allt-gronare.cid1080445
- https://onlinelibrary.wiley.com/doi/full/10.1111/j.1461-0248.2011.01716.x

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2 CHLOROPLAST ION CHANNELS/ TRANSPORTERS IN ARABIDOPSIS

Biologi, molekylärbiologi, fotosyntes, kemi

Projektidé från **Göteborgs Universitet**

INTRODUKTION

The aim of the project is to understand how ions move across chloroplast membranes and their role in regulation of photosynthesis in a fluctuating light environment. The project involves use of molecular biology, protein analyses and chlorophyll fluorescence in Arabidopsis wild type and knockout mutants. Types of proteins in focus: Mg2+ and Ca2+ channels/transporters.

KÄLLOR/MATERIAL

- https://science.gu.se/forskning
- https://bioenv.gu.se/english/research/main-research-areas/physiology-cellbiology/regulation-of-photosynthesis-and-biofuel-production/ongoing-projects/regulation-of-photosynthesis-by-ion-fluxes-in-a-rapidly-changing-environment
- http://www.plantphysiol.org/content/177/1/271

- https://onlinelibrary.wiley.com/doi/full/10.1111/ppl.12568

MER INFORMATION

The so far characterized proteins mediating ion fluxes across thylakoids appear to play critical roles in regulating photosynthesis in response to changes in the natural environment of land plants such as Arabidopsis. Environmental conditions have greatly changed throughout evolution, and various types of photosynthetic organisms grow in very different environments (land/aquatic) and with distinct pattern of perturbations. Therefore, it is expected that if homologues of genes for ion fluxes are present in algae and cyanobacteria, their functions may not necessarily be the same, and their absence in either of these could suggest a specific invention to cope with the fluctuations in the particular environment.

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3 IMPROVING PHOTOSYNTHETIC ENERGY CONVERSION FOR BIOMASS PRODUCTION

Biologi, molekylärbiologi, fotosyntes, kemi

Projektidé från **Göteborgs Universitet**

INTRODUKTION

The aim of this project is to find suitable algae strains for whole year production of renewable biomass on the Swedish west Coast. The project is in collaboration and involves screening a collection at UGOT using chromatographic and photosynthetic methods for strains with high lipid production and good acclimation to a dynamic light environment.

KÄLLOR/MATERIAL

- https://science.gu.se/forskning

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- https://bioenv.gu.se/english/research/main-research-areas/physiology-cellbiology/regulation-of-photosynthesis-and-biofuel-production/ongoing-projects/biofuel-production-in-microalgae-on-the-swedish-west-coast

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4 FUNCTIONAL GENOMICS OF MARINE DIATOMS

Marin biologi, genetik, molekylärbiologi, fysiologi

Projektidé från **Göteborgs Universitet**

INTRODUKTION

Diatoms perform around 20% of global photosynthesis and thus play a crucial role in the world's carbon assimilation. They are also central to global biogeochemical cycles through the mineralization of silica, carbon and nitrogen. The long-term goal of our research is to understand the genetic and molecular mechanisms underlying the success of marine diatoms within the phytoplankton communities and how this will be affected by ongoing climate change. The model species is Skeletonema marinoi, a chainforming diatom that is abundant in coastal regions worldwide. Along with the recently completed genome sequence, genetic transformation of S. marinoi has now been developed and the molecular tools for identifying the genomic insertion site in each transformant. Many of these insertions disrupt native genes, thereby creating specific loss-of-function mutants. These transformants are now part of a larger S. marinoi mutant collection (SMMC) that will be used to link gene function to different diatom characteristics.

The long-term goal of our research is to understand the genetic and molecular mechanisms underlying the success of marine diatoms within the phytoplankton communities and how this will be affected by ongoing climate change.

KÄLLOR/MATERIAL

- https://science.gu.se/forskning
- http://dx.doi.org/10.1128/mra.00482-19
- https://www.nature.com/articles/s41598-019-41085-5

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MER INFORMATION

Phenotypic screening of the SMMC

The student will use the SMMC to search for mutants affected in important physiological traits, such as nutrient uptake and assimilation (e.g., Fe, Si, N),adaptation to different environmental factors (salinity, temperature, pH) or chemical sensitivity (e.g., heavy metals, pharmaceuticals).

Generation, identification and characteriszation of mutant lines

The student will use the developed transformation method to generate additional mutant lines in order to map the genomic insertion site within each. Depending on the gene identity in each mutant, the resulting phenotypes will be examined to determine the specific function of each gene and their significance for S. marinoi growth and development.

The microbiome of diatoms

Each diatom is surrounded by a very specific set of microorganisms. Eight of these have been isolated from the Skeletonema culture. The student will try to determine a specific role for one or more of these bacteria involved in their interaction with the diatom.