UNIVERSITY OF GOTHENBURG

Marine Paint

Marine Paint Optimisation: Settling assays with marine periphyton communities and sea lettuce

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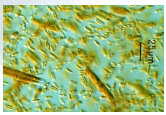
Optimisation of efficacy vs risk using multi-component mixtures of antifoulants

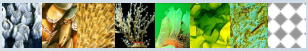
The Optimisation-Formulation-Performance research route in Marine Paint sets out to identify efficacious biocide combinations with minimal environmental risk.

With the help of specially developed computer algorithms the hundreds of thousands of combinations will be sorted out and ranked in terms of efficacy.

A minor portion of the combinations – those indicating best efficacy at lowest risk – will be transferred to the formulation project within Marine Paint for micro-encapsulation and later to the performance project for fouling testing in a marine environment.



Experimental Approach with Biocides and Foulers in Focus



Borocide®P, KH 101, TPBP (triphenylboronpyridine)								
Cu^{2+}, copper								
CopperPyrithione Copper OMADINE™								
Irgarol® 1051								
Medetomidine, catemine								
Sea-Nine®211 N, DCOIT,Kathon™287TN								
Tolylfluanid, Preventol A5S								
?								

How do we perform settling assays with periphyton and Ulva zoospores?

Marine periphyton or "slime" are microbial communities with high biodiversity and differential sensitivity.

➢ Microbial communities consist of a multitude of different microbial fouling species and can be sampled from the field using artificial substratum. We used Plexiglas slides that were colonised for 2-4 weeks at 1 m depth.
➢ We made an inoculum by scraping off the biofilm into filtered sea water with added nutrients, shaking the slide and biofilm vigorously and sieving using a 100 µm mesh.

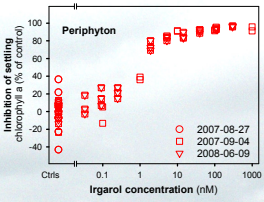
Sea lettuce belongs to an important group of fouling macroalgae.

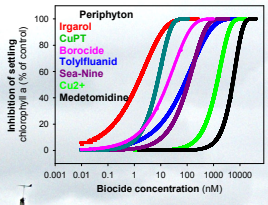
➢ We collected thalli of *Ulva lactuca* from the field and cultivated these indoors.
➢ Pieces of *U. lactuca* with mature zoospores were placed in Petri dishes with filtered sea water and algal growth medium and placed under intense light to release mature zoospores that were used as inoculum.

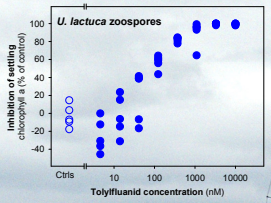
Setttling assays

➢ We used glass vessels (20mL) and distributed inoculum, filtered seawater and biocides in a total volume of 10 mL. Plexiglas settling slides were placed in each vessel.
➢ The incubation vessels were placed on a shaker and incubated at 15°C and a day-night regime (16:8). For the Ulva zoospore assay the vessels were first kept in darkness for three hours to allow an even spore settlement.
➢ After 24 and 48 hours the slides were moved to new vessels containing fresh solutions.
➢ After 72 hours of settling/growth a removable piece was broken off the Plexiglas slides and placed in 10 ml of ethanol (96%) and placed on a shaker over night to elute chlorophyll, measured using a Turner fluorometer. Settling efficacy was thereby estimated as chlorophyll *a*.

First results from efficacy testing







All tested biocides inhibit settling and growth of periphyton. The low variance and high reproduciblity make the periphyton assay a suitable settling assay for predictive mixture studies such as the Optimisation project.

The **work with *Ulva* is in progress** with the aim to develop a parallel set of data as for periphyton.

Look out for related presentations 29P-12, 30A-2-4 & 30A-5-2 from Marine Paint!

Marine Paint is a Swedish research programme funded by MISTRA aimed at developing new and effective marine antifouling paints, which are more environmentally friendly than those in use today. *www.marinepaint.se*

We gratefully acknowledge Arch Chemicals, Rohm&Haas, Ciba Specialty Chemicals GmbH, I-Tech AB and Lanxess for providing biocides and information about their products.

All photos by Ida Wendt except for Ulva (Andreas Nyström), periphyton (Mats Kuylenstierna), barnacles (Alexandra Wattwil), mussels and Ciona (Maria Asplund) and hydroids and bryozoa (Judith Fuchs)