

TREATMENT OF SLUDGE PRODUCED IN A RECIRCULATING AQUACULTURE SYSTEM: TEST OF DIFFERENT FLOCCULANTS TO IMPROVE THE SEDIMENTATION OF SUSPENDED SOLIDS

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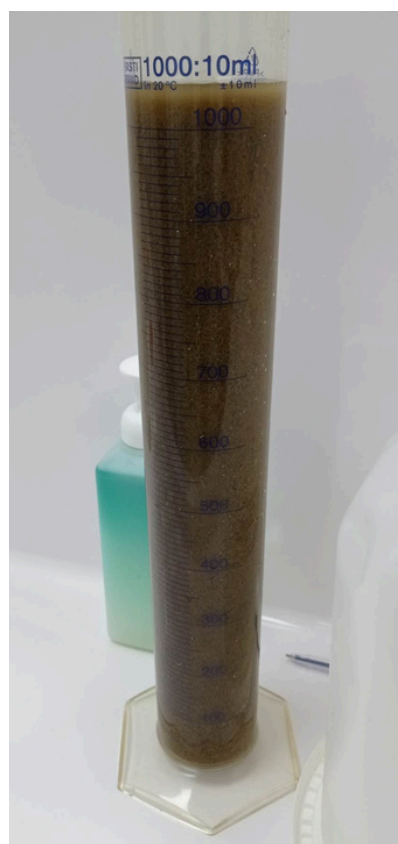
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Sludge management is a challenge in aquaculture as its release into the environment has an impact on natural ecosystems. The present research, carried out within the SEA2LAND project, focuses on developing methods to treat sludge produced in Recirculating Aquaculture Systems (RAS), in order to recover the solid fraction, and re-send the clean water to the fish tanks.

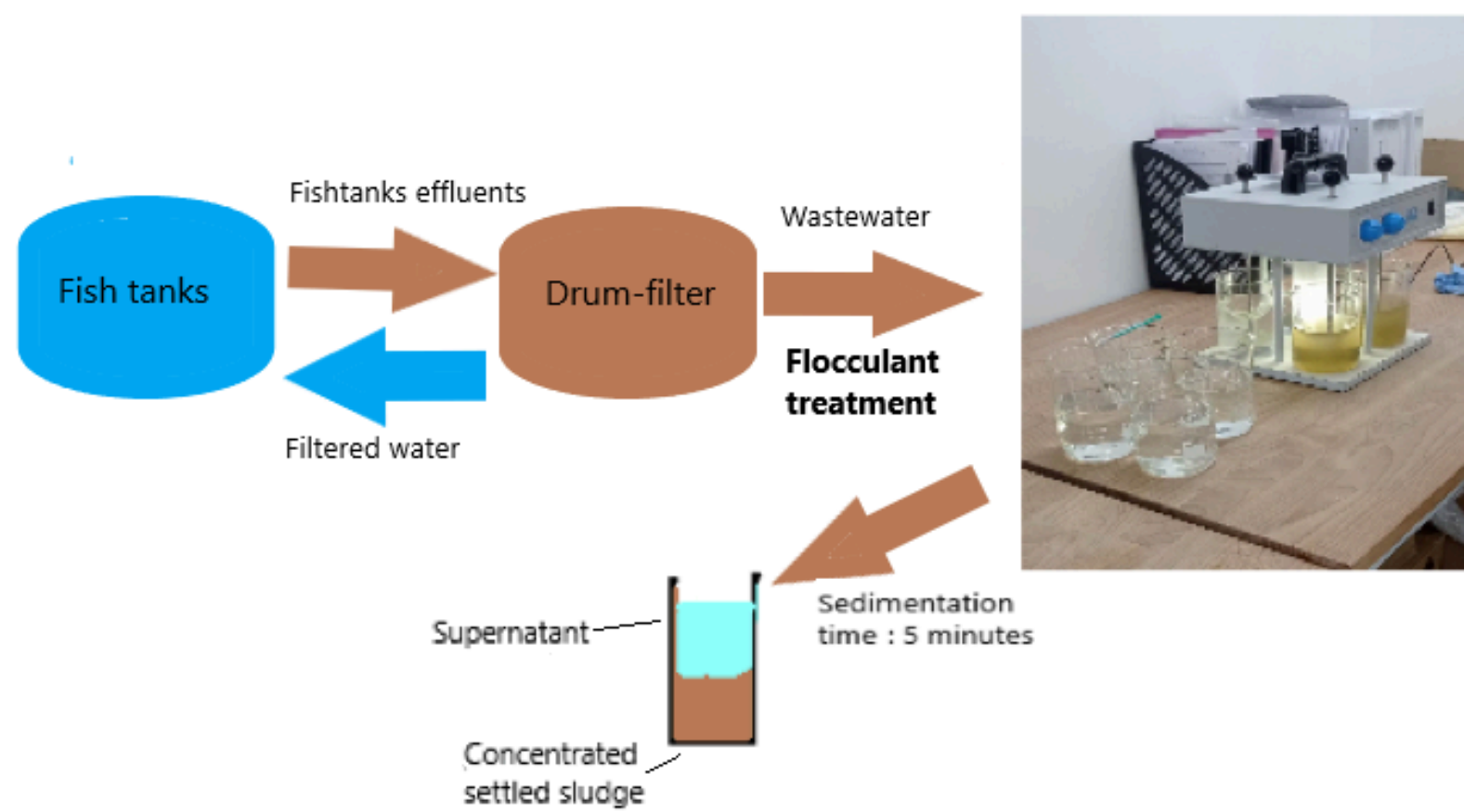
Flocculation, is a common method to increase the size of the suspended solid and promote their precipitation.

The aim of this study is to identify the most efficient flocculants for the treatment of sludge produced in RAS where Atlantic salmon (*Salmo salar*) and European seabass (*Dicentrarchus labrax*) are farmed.

MATERIALS AND METHODS



Acrylamide-based flocculants and chitosan were applied to wastewater exiting the drum-filter of a RAS, with the back-wash function. Effluents produced in salmon smolts (freshwater) and seabass (seawater) were treated in the experiments. Flocculation was enhanced by the FP4 Portable Flocculation Tester, from Velp Scientifica.



The four trials performed and treatments applied are summarised in the table below:

Atlantic salmon		European Seabass																			
Trial 1	<table border="1"> <tr> <th>Flocculant treatment</th> <th>Flocculation time</th> <th>Sedimentation time</th> </tr> <tr> <td>DR3000GR 15ppm 20ppm 25ppm</td> <td>5 min</td> <td>5 min</td> </tr> <tr> <td>No treatment Control</td> <td></td> <td>5 min</td> </tr> </table>	Flocculant treatment	Flocculation time	Sedimentation time	DR3000GR 15ppm 20ppm 25ppm	5 min	5 min	No treatment Control		5 min	Trial 3	<table border="1"> <tr> <th>Flocculant treatment</th> <th>Flocculation time</th> <th>Sedimentation time</th> </tr> <tr> <td>DR3000GR 20ppm 25ppm AFA40 20ppm 30ppm</td> <td>5 min</td> <td>5 min</td> </tr> <tr> <td>No treatment Control</td> <td></td> <td>5 min / 30 min</td> </tr> </table>	Flocculant treatment	Flocculation time	Sedimentation time	DR3000GR 20ppm 25ppm AFA40 20ppm 30ppm	5 min	5 min	No treatment Control		5 min / 30 min
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Turbidity, salinity, conductivity and Total Dissolved Solids of the supernatant were monitored using HACH 2100Qis and HACH HQ40d. A MULTIVAC 610 device and a V20 series pump, from LBX Instruments, were used to measure the Total Suspended Solids.

Dry matter in the supernatant and in the sediments, was assessed by syphoning out the supernatant and oven-drying the two fractions at 60 degrees until stabilization of the weight.



To learn more about the SEA2LAND project and the production of Bio-Based Fertilizers from fish by-products, visit us at our website:

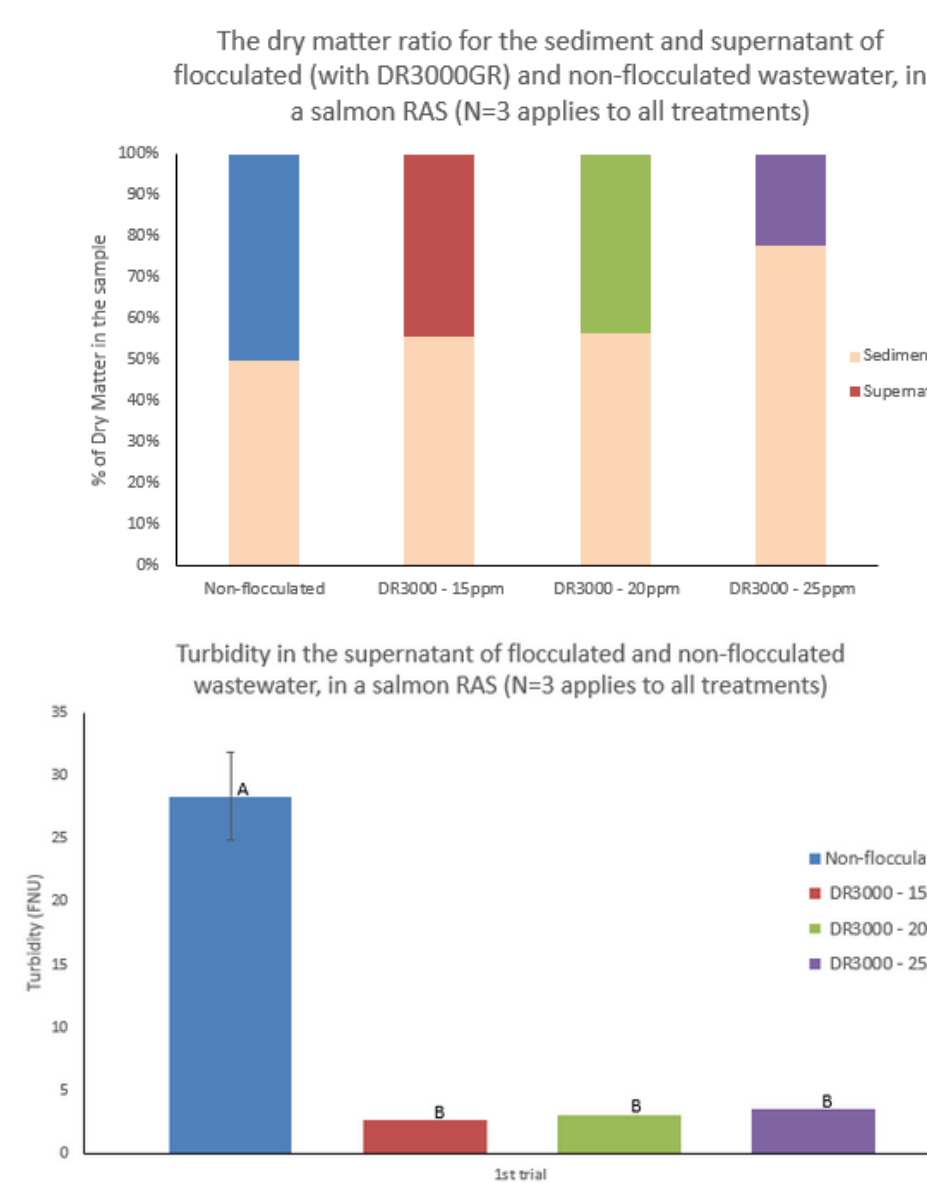
SCAN ME

RESULTS

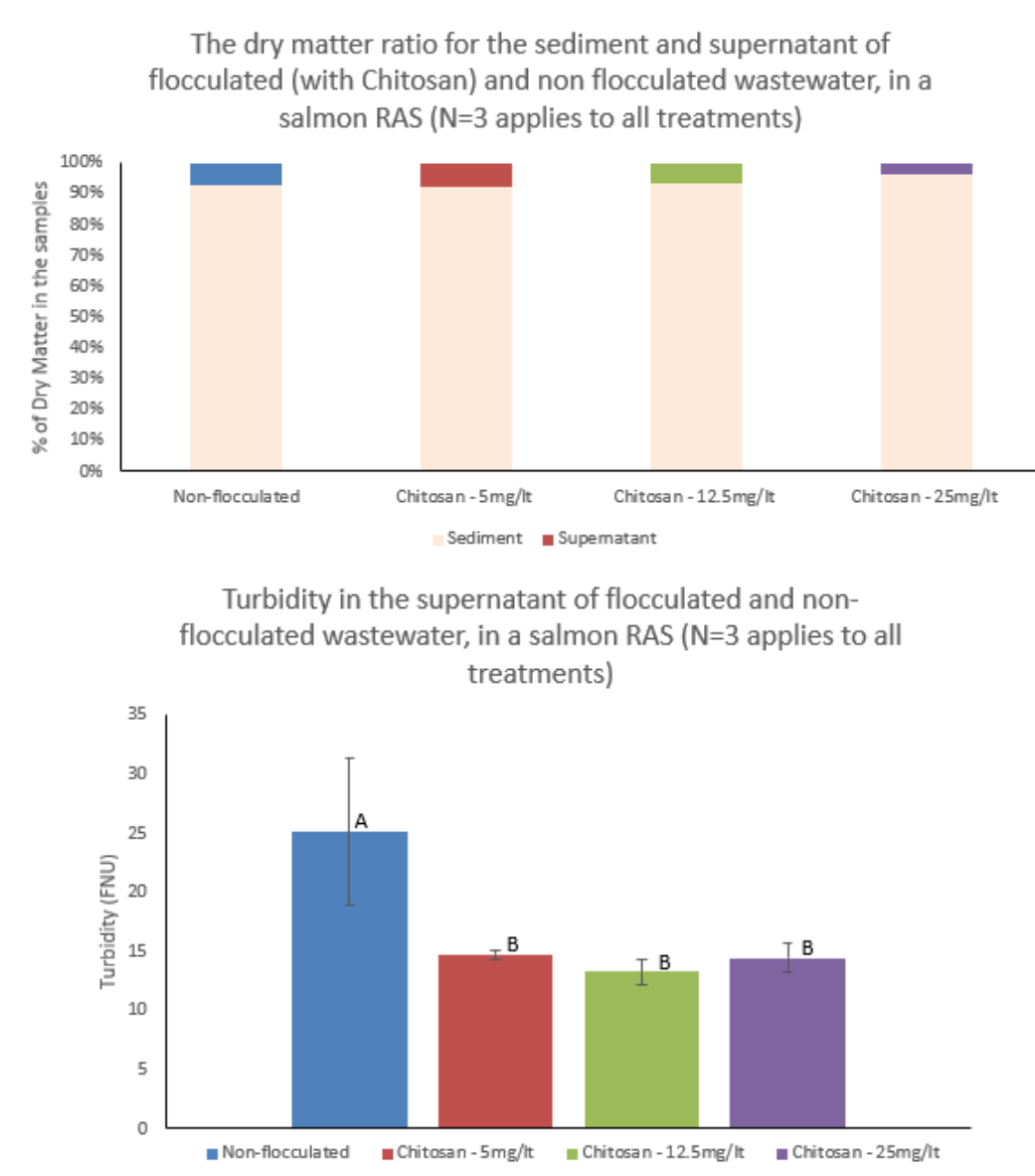
Water quality parameters

- The best flocculant treatments for turbidity removal were found to be: 20ppm of AFA40 tested on *D. labrax* effluent with 87.4% turbidity removal and 15ppm of DR3000GR tested on *S. salar* effluent, with 90.6% turbidity removal.
- Dry Matter percentage in the sediments and supernatants did not show any statistically significant differences in any of the treatments.
- Salinity and conductivity were not affected by the treatment with DERYPOL's flocculants

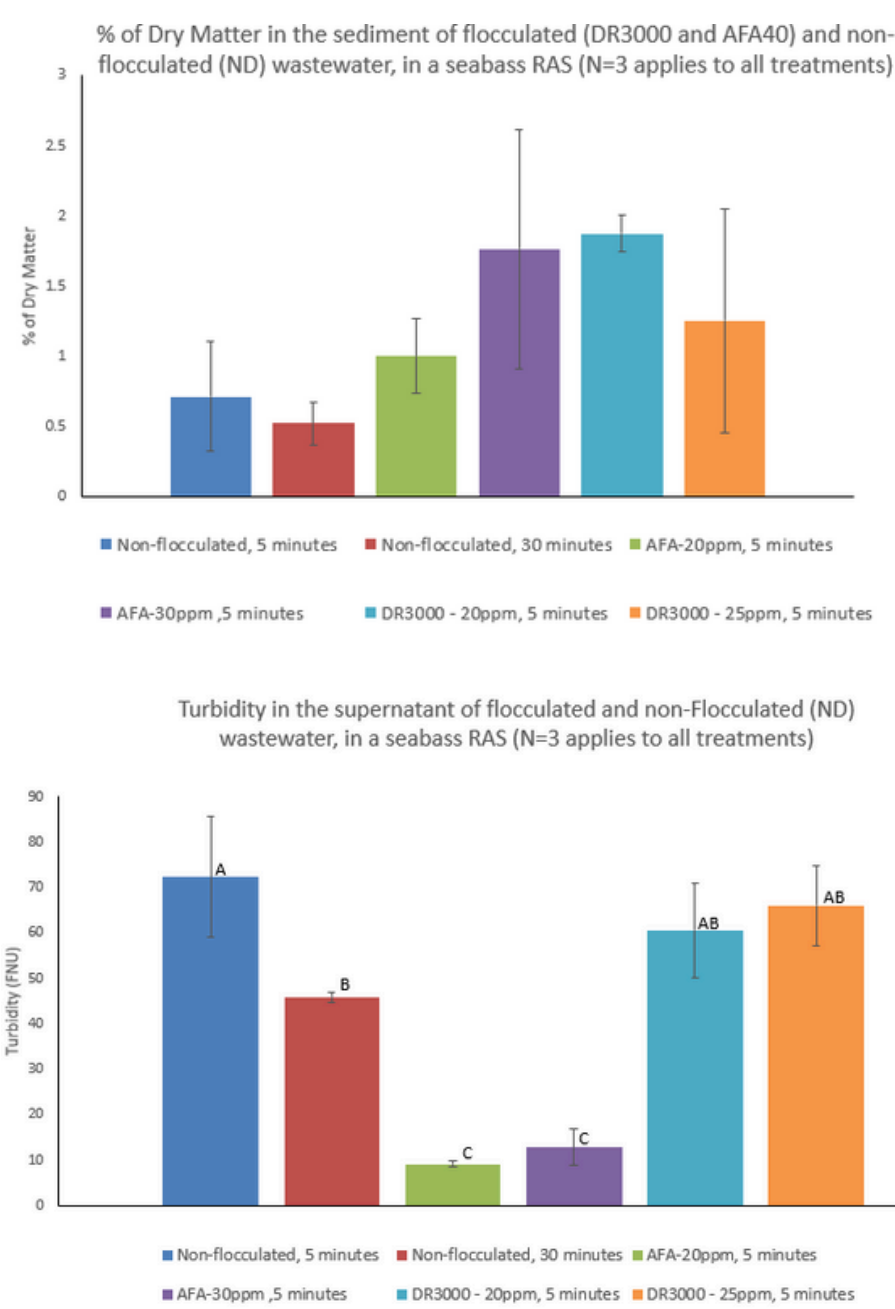
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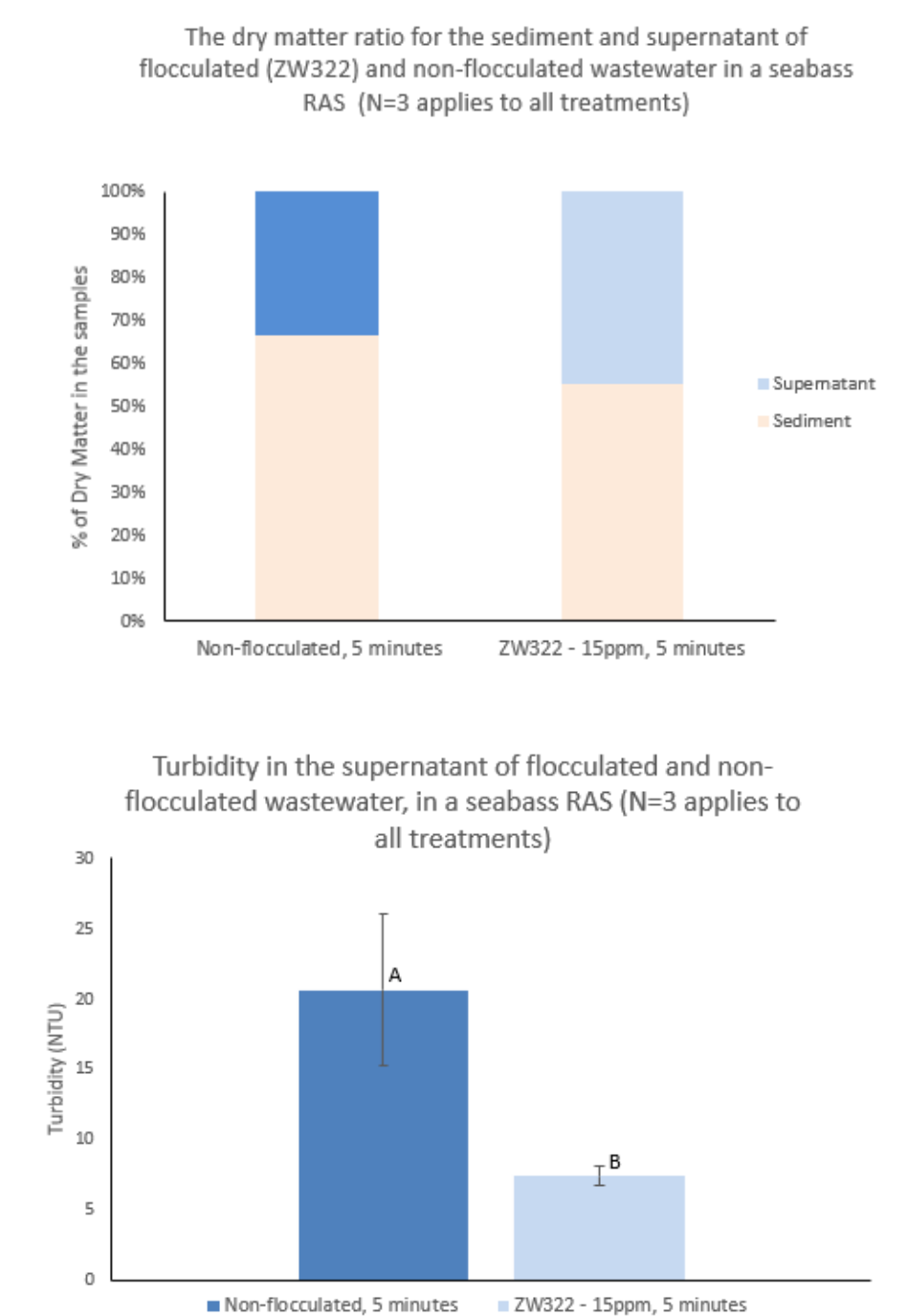
Trial 2



Trial 3

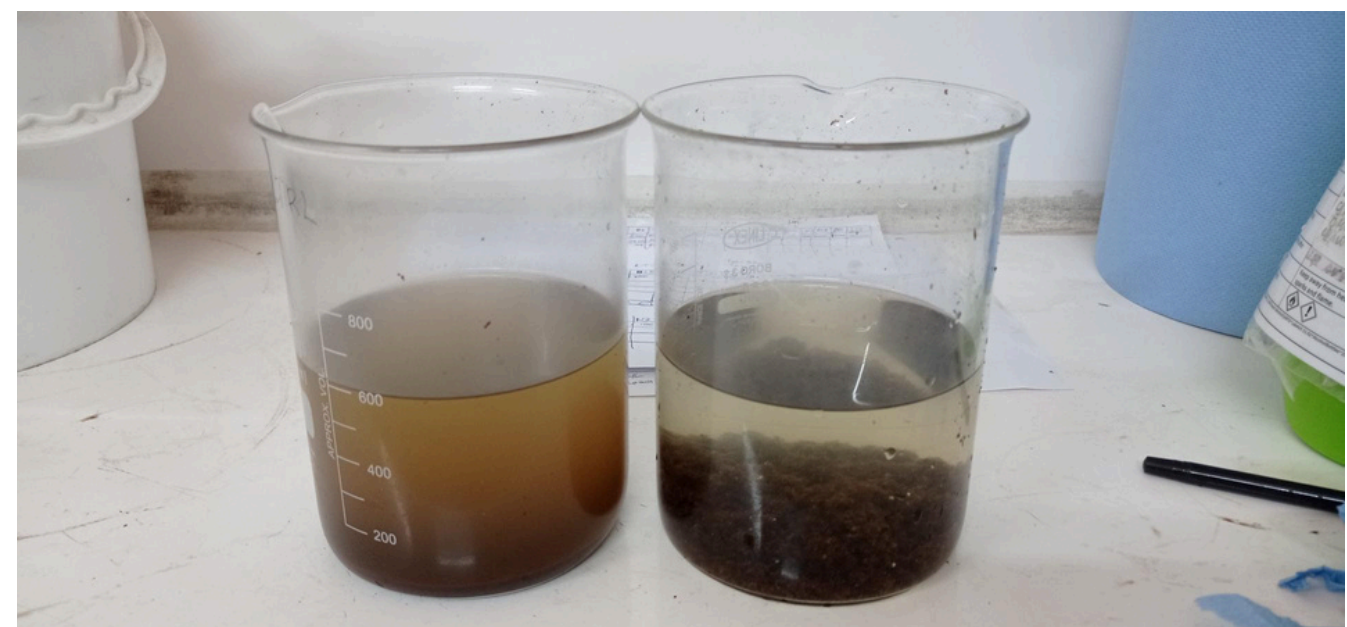


Trial 4



Visual inspection

Flocculants promoted a faster sedimentation compared to non-treated water in all the trials



Sedimentation in non-flocculated wastewater (left) and flocculated wastewater (right), 5 minutes post flocculation.

PRELIMINARY CONCLUSIONS

- DERYPOL flocculants perform excellently after drum-filters and remove turbidity in wastewater both in freshwater and in seawater environment
- The flocculants decrease the sedimentation time.
- The overall results indicated that a percentage of treated wastewater could be re-introduced in the system, reducing the consumption of water and energy.
- Flocculation did not increase significantly the dry matter (<20%) of the sediments. This remains currently unexplained and it should be further investigated within the SEA2LAND project.

NEXT STEPS

- Trials with chitosan extracted from shrimps to evaluate its efficiency as flocculant in wastewater from seabass.
- Long term effects of flocculants on fish and the efficiency of RAS.



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