



Meeting Minutes

WP2 – 3rd WP Meeting

Date: 01-11-2016
Time: 13:30 – 14:30
Location: Skype

Participants

| <i>Name</i> | <i>Company/Institute</i> |
|----------------------------|--------------------------|
| Dimitar Borisov Karakashev | DTI |
| Xiaoru Hou | DTI |
| Jelle van Leeuwen | DLO-WUR |
| Nicole Engelen | DLO-WUR |
| Paulien Harmsen | DLO- WUR |
| Wouter Huijgen | ECN |
| Bryndís Björnsdóttir | MATIS |
| Olafur H. Fridjonsson | MATIS |
| Antoine Moenaert | MATIS |
| Ben McKay | AVT |
| Rene Schepens | FEXP |

Agenda

- Seaweed Biomass
- Task 2.1 Conditioning and storage
- Task 2.3 Enzyme pretreatment
- Task 2.4 Fractionation and mild chemical treatment
- Open discussion (ensiling & other)
- Next meeting



Minutes of meeting

1. Action Items

Will be noted with ACT x and highlighted by green letters in the following minutes.

2. Seaweed Biomass

Xiaoru informed some updates of WP1, according to the information she got from Adrian and Bert. SAMS has started the deployment of *Saccharina* and *Alaria* on different SIOEN's substrates (like ribbons, sheet *etc.*), for the bulk biomass required for next year. The deployment is expected to be finish in the end of November. At the moment, SAMS has decided not following *Palmaria*, due to the very slow growth rate of the species. For *Ulva* cultivation, SAMS also met problems of site selections, and may not start so soon.

For the biomass DTI received, the 5 kg Frozen *Saccharina latissimi* was heavily fouled. But SAMS would like to know the sugar content still in this fouling *Saccharina* (to give them a starting point of the year), since, as Adrian claimed that fouling is difficult to avoid. **ACT1: DTI has prepared the hydrolysed samples from the separated heavily fouling, less-fouling, and air-dried whole sample (or so called mixed sample), which are to be sent to ECN on Wednesday, asking for composition analysis, as being agreed with Wouter last week. The results are expected to obtain in the end of November.**

If in case there is no or very low sugar contained in *Saccharina*, SAMS have about 2.5 kg of clean *Alaria* sampled from June 2015 and about 20~30 kg fresh frozen samples (natural species frozen-defrost-frozen again) from August this year that can be sent as a back-up brown seaweed.

Jelle concerned if DLO would get enough seaweed biomass for next year for their tasks of e.g. mechanical treatment. Wouter mentioned that for next year, beside the cultivated *Saccharina* and *Alaria*, ECN would like to continuously get *Palmaria* and *Ulva* (From SAMS) of which wild type would be OK. **ACT2: Xiaoru will send a new biomass request excel sheet to all the WP2 partners, for collecting information of required biomass amount and biomass species for year 2017. After the table being completed, she will send this information sheet to WP1, and send back WP1's feedbacks to WP2 partners.**

Wouter informed that ECN has done the composition analysis for the fresh and air-dried seaweed biomass they received (e.g. *Saccharina*, *Palmaria*, *Ulva*...). **ACT3: Wouter will share these data to WP2 partners within next days.**

3. Task 2.1 Conditioning and Storage (DTI, ECN):

Due to the heavily fouled *Saccharina latissima* biomass (both fresh frozen and air-dried) received, DTI decided to separate apart the fouling biomass and clean leaves (DTI was afraid that the heavily fouled dried biomass with shells/snails *etc.* cannot be used for testing the behavior of laminarinase *etc.* mixture, due to the changed sugar compositions). DTI used the separated less-fouling parts for oven drying test on three different temperatures at



105°C, 70°C, and 55°C for drying 150 g defrost *S. latissima*. **ACT4: Xiaoru will send the HPLC samples to Wouter also on Wednesday, to see if there is any effect on sugar degradation during the drying process.**

DTI will do the screw pressing of the seaweed biomass *Saccharina*, *Palmaria*, and *Ulva*. Basically DTI will just look into the water removal efficiency in a table screw press, as well as the sugar loss in the liquid and antioxidant capacity.

4. Task 2.3 Enzyme pretreatment (MATIS, DTI, DLO):

There was no response from Novozymes for providing free enzymes. Anne-Belinda mentioned last week that she will try to ask the Novozymes new contact who is a partner of a newly started project. But for the moment DTI will buy the small amount of commercial enzymes for testing.

Matis have tested behavior of the recombinant enzymes (alginate lyase, and laminarinases) on *Saccharina* biomass they received from some other project, and will test those enzymes behavior on SAMS delivered air-dried *Saccharina* too. They for the moment are comparing the composition differences among the different *Saccharina* biomass they have (i.e. biomass left from another project, biomass from SAMS, and their “in house” cultivated *Saccharina*), since there need to be significant laminarin for testing the laminarinases behaviors. ECN has done the composition analysis of the *Saccharina* batch they received from SAMS (see ACT3), which could be informative to MATIS.

DTI will try the commercial enzymes in the same category with the constructed enzymes from Matis, working on the same biomass, as a comparison (commercial control). **ACT5: Xiaoru will communicate with MATIS by email and calling for a detailed plan for such comparison work.**

DLO has tried some test with enzymatic hydrolysis on *Saccharina* also, but no data to share yet. So did DTI.

5. Task 2.4 fractionation and mild chemical treatment (ECN & AVT):

ECN has run investigations on weak acid hydrolysis on red and green seaweed, weak acid/alkaline hydrolysis and direct sugar extraction from brown seaweed. ECN has delivered small amount of laminarin extract to FBR (WP3) for the initial test on ABE fermentation.

Jelle mentioned that DLO has also tried acid hydrolysis on brown seaweed. According to the previous agreement in WP2, DLO will take responsibility for providing the hydrolysate for ABE fermentation in FBR in WP3, and ECN will take responsibility for providing the sugar hydrolysate for thermochemical conversion in WP4.

The dried seaweed biomass is enough for the time being trial of palletization in AVT. They will estimate and fill in the biomass amount required for next year, when getting the biomass requirement sheet from Xiaoru.

6. Open discussion



Our new colleague Dimitar Borisov Karakashev will be the task leader of task 2.2.1 ensiling & task 2.2.2 combined ensiling and acid addition. Before coming to DTI, Dimitar worked as Senior Scientist in DTU in microbiology and anaerobic fermentation. The main collaboration between DTI and FEXP will be: 1) FEXP provide the ensiling microbes with necessary information (species etc.); 2) DTI will test the behavior of the microbes and optimize the ensiling process in lab-scale, while FEXP will do the pilot upscaling test based on the lab-scale results; 3) DTI and FEXP will collaborate with other partners in MacroFuels to evaluate ensiling as a seaweed preservation method for improving liquid biofuels production. ECN and DLO would like to receive ensiled biomass for e.g. hydrolysis efficiency test. **ACT6: Dimitar will call in a meeting with Rene for more detailed discussions.**

Wouter mentioned about the Task 2.5 purification and concentration of algal syrups. Although the task was supposed to start from M12, ECN has started the task and the membrane system for sugar concentrating has been set up and ready to process. The capacity of the system can provide several liters of concentrated hydrolysate. Wouter would like to know more specification of the components i.e. besides the sugar concentration need to reach to 60 g/L (as specified in the project plan), other information such as maximum limit of salt concentration, preference of specific sugars *etc.* from WP3 and WP4. The aim for such information is to help ECN to establish a method for providing the suitable sugar syrup for thermochemical conversion and fermentation (as D2.6 with the due date on M24). DTI does not need a concentrated sugar stream from task 2.5 in 2017. **ACT7: Wouter will discuss this further with DLO and AVT.**

Noted by Xiaoru Hou, revised by Wouter Huijgen 03.Nov.2016