17. und 18. Juni 2015

17th and 18th June 2015

CONGRESS

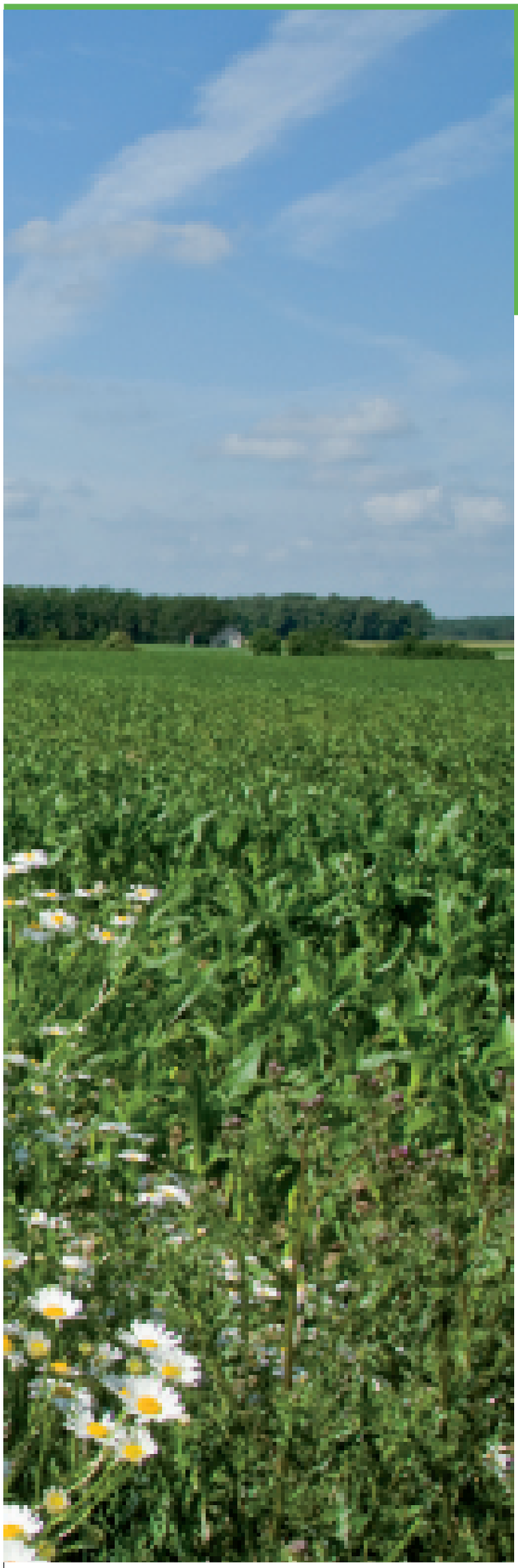
innovations from biomass –

Öko-Innovationen mit Biomasse

TAGUNGSBAND
CONGRESS BOOK

Kompetenzzentrum
Niedersachsen • Netzwerk
Nachwachsende Rohstoffe e.V.
3N

Tagungsort | venue: Hotel Alte Werft | Ölmühlenweg 1 | 26871 Papenburg



SEKTION: ALGEN
SESSION: ALGAE

NÄHRSTOFFE ALS PRODUKT
NUTRIENTS AS A PRODUCT

Chairman: Prof. Dr. Rüdiger Schulz, Christian-Albrechts-Universität Kiel, Germany

Konzepte für Algen zur Markterschließung in den Bereichen Ernährung, Kosmetik und Energie
Use of industrial ecology integrated concept to bring algae onto several market (nutrition, cosmetic, energy)
Dr. Jean-Michel Pommet, Algosource, Saint-Nazaire, France

Möglichkeiten zum Einsatz von Algen als Bestandteil der Tierernährung
Opportunities of algae as ingredient for animal feed
Dr. Rommie van der Weide, Dr. Marinus van Krimpen, Wageningen UR, Lelystad., The Netherlands

Produktion von Mikroalgen und Bioraffinerien mittels Einführung in industrielle Symbiosekonzepte
Facilitating microalgae production and biorefineries
Per Møller, Kalundborg Kommune - Cluster Biofuels, Denmark

Kaffeepause | Coffee break

PUFAChain - die Wertschöpfungskette von Algenbiomasse zu lipidbasierten Produkten
PUFAChain - a value chain from algal biomass to lipid-based products
Prof. Dr. Thomas Friedl, Georg-August-Universität Göttingen, Germany

Produktion von Algen-Bakterien-Flocken unter Ausnutzung von Sonnenlicht und Abwasser
Converting industrial wastewaters and sunlight into microalgal bacterial flocs and beyond
Dr. Sofie Van Den Hende, Ghent University, Kortrijk, Belgium

Biotechnologisches Screening von Mikroalgenstämmen mit dem Ziel Biomassenutzung
Biotechnological screening of microalgal strains for biomass utilisation
Dr. Opayi Mudimu, Christian-Albrechts-Universität Kiel, Germany

Algenzucht im »Disposable Bioreaktor« - vom Pilot- zum Großmaßstab an Biogasanlagen
Growing microalgae in dispoable bioreactors - the way from pilot-scale to large-scale for biogas-plants
Bert Knol, Algaecom, Groningen, Netherlands

Diskussion | Discussion

Come together

Lower Saxony Round table Algae
(separate registration required)

Konzepte für Algen zur Markterschließung in den Bereichen Ernährung, Kosmetik und Energie

13:30 - 13:50

Use of industrial ecology integrated concept to bring algae onto several market (nutrition, cosmetic, energy)

Dr. Jean-Michel Pommet
Algosource, Saint-Nazaire, France

How to concretely access industrial sectors from bioprospection with microalgae: production tools' innovation, biomass global refinery, waste to value to compete with existing solutions / raw material / ingredients
The most ancient Spirulina farm in France, Alpha Biotech, belongs today to AlgoSource which is now a global expert in microalgae from strain selection, photobioreactors' design to grow at lab and large scale, process engineering and biomass refinery to provide high value molecules for the entire industry. Based on an expertise acquired during more than 20 years, the company has developed both standardized large–scale production of Spirulina and other microalgae biomasses with international quality–certificates and permanently developed a bioprospective approach with its algorefinery strategy to extract their content value. Among these molecules or extracts, for example the phycocyanine has been isolated and concentrated in liquid form called Spirulysat® today concretely developed on the food supplement market.
AlgoSource expertise in the field of microalgae allows to select the right strains and propose, through its modelling tools developed in partnership with the GEPEA laboratory of the University of Nantes (Joint-Research Unit CNRS specialized in Bioprocess Engineering applied to microalgae), adapted technological solutions for any industrial application.

This very complementary expertise between a public lab and a private company has allowed to define the right strategy to answer industrial constraint like an affordable price to apply microalgae in sectors like food, feed, aquaculture, nutraceuticals, cosmetic and pharma.

Among the strategies used by AlgoSource, you will find:
> Produce competitive advantage
Value of local natural and industrial resources to optimize the production of microalgae: Fatal heat, water, carbon dioxide emissions, abatement of nitrogen or phosphorus in liquid effluents.
This approach allows to improve the economic and environmental assessments of projects.
Example of projects with positive environmental impact : CO2 capture in the cement industry; heat value in methanation project; smart cities and bio-bitumen
> Biorefinery of microalgae to optimize the value
The AlgoSource approach aims to value the complete biomass to improve the economy of a project and the environmental performance of products. It is optimized by a refining process which takes into account the physiological structure of microalgae and optimization of this method of splitting structure for separating target compounds. This is an eco-design concept which improves the sustainability of processes implemented in a global algorefinery approach.

Realizing the potential of microalgae can be achieved by the integration of production systems and processing, from the specifications of the desired product. At AlgoSource, the process engineering, process design and the operation of production units are provided by a knowledge of nearly 30 years on algae.

Möglichkeiten zum Einsatz von Algen als Bestandteil der Tierernährung 13:50 - 14:10
Opportunities of algae as ingredient for animal feed

Dr. Rommie van der Weide | Dr. Marinus van Krimpen
Wageningen UR, Lelystad., The Netherlands

There is an growing need for protein production to feed the world, not competing with traditional agriculture and fishery. Algae have received growing scientific attention, mostly because of potential high biomass yields for production of proteins, lipids and chemicals. Moreover algae can be cultivated using side streams (flue gass and residual heath) and recycling nutrients from leftover process water.

At ACRRES (Application Centre of Renewable Resources http://www.acrres.nl/en/) an innovative concept of small farm scale biorefinery in combination with a mixed dairy-arable farm is constructed and tested by WageningenUR together with several SME's. The pilot consists of plants for anaerobic co-digestion with a CHP unit (123kwE), a maize and sugarbeet refinery, an installation to upgrade biogas to green gas, a pilot for aquatic plant cultivation and a microalgae cultivation plant (two open ponds of 250 m2 and open LED lighted bioreactors ranging from 1 to 60 m3). An pilot for rearing insects is in the planning phase. The algae plant is one of the pilots in an European project (http://www.enalgae.eu/). In the algae plant, side streams from other processes are used and tested, thus aiming at new possibilities in a circular economy.

Research is conducted to improve and innovate the production, energy usage and economics of algae production and algae usage and benchmark. Beside literature review, produced algae are tested for their value as ingredient in feed and data are generated needed for improved legislation.

Algae contain many valuable proteins, which can be safely digested by several species of farm animals as part of their diet. Algae also contain valuable vitamins and pigments. They are the main producers of the omega-3 and -6 fatty acids in the food chain. Claims that they can be a useful additive to improve the health of animals have been supported, at least partly, by research. Positive effects reported to result from algae consumption include: a low of mortality rate in young turkeys, lower microbial infection in chicks, increased milk production in cows, lower feed-based cholesterol concentration in the blood of cows, higher feed conversion efficiency in young animals. However, these effects are species-specific and dependent on growing conditions and they also differ between studies, so more research is needed. Applications of algal biomass for generating value-added animal products is also seen as a great potential.

NOTIZEN:

Produktion von Mikroalgen und Bioraffinerien mittels Einführung in industrielle Symbiosekonzepte
Facilitating microalgae production and biorefineries

14:10 - 14:30

Per Møller
Kalundborg Kommune - Cluster Biofuels, Denmark

In order to further advance in the commercialization of microalgae production, we introduce Industrial Symbiosis (IS) as a means of reducing production costs and ensuring local supplies of the limiting resources of the future. Within this concept, local residues from industries are used as resources in large scale sustainable microalgae production so that – one companies waste becomes anothers ressource. Furthermore, ecoefficient technologies related to up- and down-stream processing, are being screened and integrated into an overall concept based on photobioreactor production units. A test and demonstration site at the Kalundborg central WWTP, as part of the EU FP7 project E4WATER, offers the conceptual platform for this new approach.

Our overall process is in brief: gasified process water from neighbor industries, is converted into growth media and used in large-scale photobioreactor microalgae production. In this process CO2 is being sequestrated, and heat from the WWTP effluent reused. Means of increasing productivity and biocomposition are being developed for value optimization. A train of technologies are being tested in combination in order to produce algae paste and powder of high quality and increased shelf life. The concept, current status and latest results are being presented.

PUFAChain - die Wertschöpfungskette von Algenbiomasse zu lipidbasierten Produkten
PUFAChain - a value chain from algal biomass to lipid-based products

15:00 - 15:20

Prof. Dr. Thomas Friedl
Georg-August-Universität Göttingen, Germany

The FP7 project "PUFAChain" aims at substantiating the industrial development of sustainable high-value products from microalgae. To produce highly purified omega -3 fatty acids, important building blocks in modern oleo chemistry, a complete microalga- based process from feedstock production and harvesting to oil extraction and purification will be assembled from lab to demonstrative prototype level. A consortium with 6 companies and 3 research institutes will evaluate and develop innovative technologies by taking advantage of a complimentary partnership. Poly Unsaturated Fatty Acids (PUFAs), in particular DHA and EPA, are recognized as important to support human health. PUFAs are present in large amounts in fish oil and cephalopods, but the concentration of EPA/DHA in fish oil varies considerably, depending on location, annual season and availability of phytoplankton. In addition, with the upcoming shortages due to environmental threats such as pollution of oceans microalgae represent a promising alternative source for PUFAs. Through the algal cultivation process, contaminants (e.g. heavy metals) and other unwanted by-products can be avoided. Certain Algal strains may provide EPA/DHA more selectively and this facilitates the further isolation and purification of target products. Remarkably, algae are the only form of life which can readily produce PUFAs directly using the energy from the sun. PUFA accumulation in algae is a response to stress, e.g. photooxidative injuries. In a biorefinery concept, one of the targets of PUFAChain, a broad spectrum of bio-based products like food, feed, materials, chemicals and energy carriers like fuels or biogas are produced concurrently and all fractions of the produced biomass are exploited.

Produktion von Algen-Bakterien-Flocken unter Ausnutzung von Sonnenlicht und Abwasser

15:20 - 15:40

Converting industrial wastewaters and sunlight into microalgal bacterial flocs and beyond

Dr. Sofie Van Den Hende
Ghent University, Kortrijk, Belgium

With principles of sustainability gaining greater value in all fields of engineering, conventional wastewater treatment systems solely focusing on pollutant removal are facing increased scrutiny. World issues regarding depletion of resources and global warming call for a wastewater treatment with nutrient recovery and decreased greenhouse gas emissions. Although water sanitation dates back from the Mesopotamian times, the ultimate wastewater treatment is yet to be designed. Microalgae could play a key role in this redesign. Being photosynthetic microorganisms, microalgae can lower the emission of CO2, replace the expensive mechanical aeration of wastewater by photosynthetic aeration, scavenge resources from the wastewater, and convert solar energy into biomass.
Recently, there has been a renaissance of interest in dual-purpose microalgal bacterial technology which couples wastewater treatment based on photosynthetic aeration with the production of microalgal bacterial biomass. Nevertheless, several challenges hamper the implementation of this technology in northwest Europe. A major challenge is the high cost of the separation of the treated wastewater from the microalgal bacterial biomass. Therefore, the innovative concept of microalgal bacterial flocs in raceway ponds operated as sequencing batch reactors (MaB-floc SBR raceway pond) was developed. Operation as SBR selects fast-settling MaB-flocs via bioflocculation. This results in a costless separation of the MaB-flocs from the treated wastewater, akin to conventional activated sludge systems. This concept was screened in lab-scale reactors for treatment of various wastewaters and was up-scaled to an outdoor raceway pond for treatment of pikeperch aquaculture and food industry wastewater in Belgium. Furthermore, the potential of the harvested MaB-floc biomass to use as feedstock for anaerobic digestion to biogas, to include in feed for Pacific white shrimp and to use as slow-release fertilizer for tomato hydroculture was investigated.
To identify the critical research needs for MaB-floc technology, an overview of the features and limitations of this technology is presented. Bioflocculation, reactor operation, wastewater treatment, flue gas injection, biomass productivity and harvesting, environmental impact assessment and legislation are discussed. Furthermore, future perspectives of MaB-floc technology are outlined to set the stage for future collaborations and eco-innovations.

The EnAlgae project receives funding from the INTERREG IVB NWE program, the Flemish Government and province West-Flanders

NOTIZEN:

Biotechnologisches Screening von Mikroalgenstämmen mit dem Ziel Biomassenutzung
Biotechnological screening of microalgal strains for biomass utilisation

15:40 - 16:00

Dr. Opayi Mudimu
Christian-Albrechts-Universität Kiel, Germany

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Microalgae represent an enormous natural resource to generate a large number of substances. They can have pharmacological activity, be used as additives in food, feed and cosmetics or can be used for bioenergy production.

The variety of potential agents and the use of microalgae biomass for the production of these substances are little investigated and not exploited for the existing market. Because of the enormous biodiversity of microalgae, they show great promise for new products.
A large number of microalgae strains of the Culture Collection of Algae at Göttingen University (SAG) have been investigated in collaboration with several companies. In this study, a broad range of different microalgal species was screened for carbon dioxide absorption capacity, biogas production, antibacterial effects, carotenoid and chlorophyll contents, tocopherols, tocotrienols, fatty acids and hydrogenase activity. The result of the current study showed that microalgae are able to generate a large number of substances in different quantities. In addition, between closely related species and even among multiple isolates of the same species, the productivities may be rather variable.

NOTIZEN:

Algenzucht im »Disposable Bioreaktor« - vom Pilot- zum Großmaßstab an Biogasanlagen
Growing microalgae in dispoable bioreactors - the way from pilot-scale to large-scale for biogas-plants

16:00 - 16:20

Bert Knol
Algaecom, Groningen, Netherlands

Algaecom was founded in 2008 and is targeted on development and production of large scale algae growing systems, suitable for production of foodgrade algae.
We developed a plug & play growing system which can be applied on hectare scale and which offers the buyer an interesting business case. Especially when this growing system is combined with the CHP from a biogas plant.
Our algae growing system is based upon several years of developing and testing several types of disposable reactor systems. We tested about 15 different configurations before we were satisfied about crucial parameters such as costs of production and maintenance, production capacity and suitability for upscaling. The testing was done in an industrial environment, with the use of flue gasses as a source of CO_2.
We tested the technology in small scale units from 200 – 500 m2 and we developed and tested a standard production unit with a size of 2.500 m^2. We connected this unit with a biodigester and CHP, which supplied us flue gasses and (waste) heat. Extrapolating the production figures over the seasons, we calculated a production level of over 30 tons of algae per year.

In order to optimize the use of waste heat form a biogas plant, we developed a new heat transfer system and tested this system on a location of 10.000 m2, with the use of heat from a 1,2 MW CHP. This system and application were authorized by CertiQ for receiving the heat bonus under the Dutch sustainable energy jurisdiction.
Now we are ready for large scale production. We engineered a plug & play demonstration plant of 2 hectares, which should convince the potential buyers. Building this demo unit is planned to starting in August this year.

NOTIZEN:

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