From medicinal plant of the American Indians to reproducible raw material

Botanists in Düsseldorf launch research project on the cup plant

They not only want to use it as an energy crop for biogas production, but also as an insulating material and a substitute for peat. And the cup plant is also a supplier of flavonoids, an important raw material for pharmaceuticals. Pioneering work is being performed in this area by researchers in Düsseldorf together with their colleagues in Aachen and Bonn.

“When I heard for the first time how useful the cup plant can be I was completely overwhelmed”, enthuses Dr. Elena Pestsova, plant researcher in Düsseldorf. The biologist and Christian Wever, her colleague at the Chair of Developmental and Molecular Biology of Plants led by Professor Peter Westhoff, were fascinated by the cup plant, a flowering plant related to the sunflower. Together with colleagues from Aachen and Bonn, they applied to the Bioeconomy Science Center (in short BioSC; see box) for a three-year research project in the framework of which they want to examine the cup plant in depth. Topics range from characterization of ecotypes of various origins to cultivation and material use to extraction of flavonoids. SPREAD (Evaluation and development of energy plant Silphium perfoliatum L. as a source of renewable raw materials) is a cooperative project funded by BioSC to the sum of about € 660.000.

“IN THE FORMER GDR”, recounts Christian Wever, “the cup plant was very popular with beekeepers, since it is very hardy and has a long flowering season”.

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Other than that, a few farms grow it as fodder and silage. The fact that bees like it and that it makes excellent fodder are, however, just two of its many positive features.

In the first year, the cup plant is rather inconspicuous: it forms just a leaf rosette near the ground and therefore competes with wild herbs which threaten to overgrow it. These have to be removed by hand, which is very costly. Nor does the cup plant deliver any yield in the first year. But from the second year onwards, it shoots up and then produces large quantities of biomass for over ten years, from which methane can be extracted by means of fermentation: First trials have already taken place in Thuringia. But in fact the biomass recovered from the cup plant is too valuable for this. The objective of the SPREAD project is to develop new varieties of cup plant and application scenarios.

Application scenarios in the planning

The square-shaped stem is interesting as a building material: If you cut it open, you find spongy, non-lignified tissue. When dried, the stem provides a very light, airy and fine-pored material, which as a result displays a high thermal insulation value and is also interesting as a fibrous additive for use in construction materials. The Plains Indians use the cup plant as a medicinal plant, amongst others to dress and heal wounds. A particular ingredient is held partly responsible for its medical effect: Flavonoids. Amongst these flavonoids are a large part of the flower pigments of plants. They are attributed, amongst others, with antioxidant characteristics. In addition, anti-allergic, anti-inflammatory, anti-bacterial and cancer-inhibiting effects have been proven.

The cup plant is a very undemanding plant. It is at home in temperate climes,
In 2010, the universities of Aachen, Bonn and Düsseldorf together with Forschungszentrum Jülich (Forschungszentrum Jülich) founded the Bioeconomy Science Center (BioSC), a centre of excellence for sustainable bioeconomy. In the framework of the BioSC research alliance, numerous interdisciplinary partnerships between scientists at the four facilities have already evolved which were devoted to bioeconomic topics. In order to implement innovative and interdisciplinary research approaches generated in the BioSC by these partnerships, project funding can be obtained from north Rhine-Westphalia’s BioSC Strategy Project.

Since 2013, the Ministry of Innovation, Science and Research of north Rhine-Westphalia is supporting the BioSC with € 5.8 million each year for a period of at least ten years. In addition, the aim is to attract bioeconomic research projects from other third-party sources on the basis of first results from this collaboration.

Over 30 projects at the BioSC are currently being funded. BioSC projects are conditional – apart from scientific quality and relevance – on cooperation between at least two of the facilities and a focus on at least two of the BioSC’s four research priorities:

▶ Sustainable plant bioproduction and resource stewardship
▶ Microbial and molecular transformation of resources into materials
▶ Process engineering technologies for renewable resources
▶ Economy and social implications of bioeconomy

The 14 HHU chairs currently involved in the BioSC are very successful in the acquisition of projects. HHU is involved in nine of the eleven BioSC projects approved so far in 2015.

Central coordination of the BioSC is the responsibility of the BioSC Office which is located at Jülich Research Centre. Additionally, offices were installed in 2014 at the three partner universities as a contact point for researchers. The Scientific and Administrative Coordinator at the BioSC Office in Düsseldorf is Dr. Sira Groscurth.