

Emcid Biotech GmbH: mosses as gold mines

Mosses were the first plants to colonize the land and therefore were the first to have had to adapt physiologically to a broad range of adverse situations. Mosses are a great source of molecules that offer protection against microorganisms, dehydration and other stress factors. Mosses have considerable potential for use in the pharmaceutical, agricultural, food and cosmetics industries, but it is a potential that has yet to be fully exploited. Freiburg-based Emcid Biotech GmbH is developing a platform for the identification, development and industrial production of natural substances and enzymes of lower plants, in particular those of mosses. The company founders have put a lot of thought into the potential of mosses and each founder brings valuable experience to the company as well as the desire to protect a special treasure.

This company is in the described form no longer active in the market.

The first bryophytes populated the land around 450 million years ago. According to biologists, there are now around 25,000 known species of moss. Mosses can be found all over the world, from deserts to arctic zones. They are true survivors despite their seemingly primitive appearance. The mosses' descendants – modern flowering plants – had to adapt to their particular land environments by developing a broad range of different organs such as air roots, storage bulbs or wooden stalks and by colonizing specific ecosystem niches. Not so the mosses; they adapted to any new situation – heat, cool, bacteria and high salt concentrations – on the physiological level and were thus able to colonize a broad range of ecosystems. “We believe that moss substances have considerable potential to be used in many sectors of the fine chemicals industry,” said Dr. Gilbert Gorr, company founder and one of Emcid Biotech GmbH’s managing directors. He added: “The microbial properties of moss extracts can be of major advantage in the food and cosmetics industries, for example.”



Mosses are rather inconspicuous plants, at least at first sight. But they have a lot to offer. © Emcid Biotech GmbH

The company's core



Andreas Kranzusch (left) and Dr. Gilbert Gorr (right) of Emcid Biotech GmbH © Emcid Biotech GmbH

Gilbert Gorr and his colleague Andreas Kranzusch developed the idea of exploiting the potential of moss a couple of years ago when they were working for a Freiburg-based company that focuses on the biotechnological application of the moss *Physcomitrella patens*. They left the company in 2009 to turn their idea into reality. Gorr, who did his doctorate on the biology of mosses,

recognized the potential of *Physcomitrella patens* and other moss species. He joined forces with Andreas Kranzusch who had a great deal of experience in commercial issues and the two developed a business model that they then discussed in detail with colleagues from the biotech industry to ensure that it was viable. “We thoroughly researched the market, and took it from there,” said Kranzusch. “We wanted to make sure that we had something substantial to offer before we actually entered the market.” In the event, Eמיד could be sure that its offer had considerable commercial substance, as the company’s core collection consisted of the axenic cultures of around 25 moss species which Gorr had inherited from a retired professor. It is a collection that is constantly being expanded.

“It takes a long time to establish a biobank with isolated species without also including the bacterial parasites that usually grow on the mosses in their natural environment. We own one of the largest collections in the world,” said Gorr. The company’s collection is an authentic gold mine as it is relatively easy to “tap” into the metabolic pathways of isolated mosses, something that is far more difficult to do with other plant groups. Bryophytes are generalists and tolerate a broad range of different environmental conditions; they are thus relatively easy to cultivate in the laboratory. The climatic chamber in the laboratories of Eמיד Biotech GmbH where the mosses are exposed to constant temperature, light and humidity conditions at all times, is big enough to house all 25 species. They are grown in flasks and no single moss has any special requirements. Gorr and his colleagues are highly skilled in the techniques of cell biology and are thus able to produce extracts of a specific moss species relatively quickly and test their antimicrobial activity, an ability that many of the company’s industrial clients are extremely interested in.

Open to anything, but from a firm footing

“We tailor our services to individual client requirements,” said Gorr, going on to explain that “we usually start by producing an extract of a moss species that has the biochemical characteristics a particular client is looking for. If required by the client, we will also isolate, characterize and optimize individual molecules and molecule combinations using biotechnological methods. These molecules and molecule combinations can then be used for relatively specific chemical applications.” To date, the majority of Eמיד Biotech GmbH’s clients have come from the food and cosmetics industries. However, Gorr and Kranzusch are open to other potential uses of their mosses, including the ability of some moss species to remove heavy metals from contaminated soil and bind them permanently. “We also believe that organic farming, environmental technology and the pharmaceutical industry will be excellent future partners,” said Kranzusch going on to add “but it is crucial for us to find a solid business model that will help us stay on a firm footing.”

The company finances itself through its own revenues. However, resources are rather limited and do not allow Eמיד to undertake large projects such as the development of an antimicrobial drug. Gorr and Kranzusch have therefore already started contacting potential investors. “We have a decisive advantage, and this is constantly corroborated by industry, in that we have an excellent source of natural substances, which we are able to precisely control using cell biology methods,” said Gorr. “Take the following scenario. A company that finds an interesting substance in a natural extract. This substance is only of value if the company is able to produce this extract in large quantities in a standardized form. And this is exactly what we would like to do.” Eמיד GmbH currently employs four people, but hopes to grow over the next few years. It also hopes to be able to tap into a broad range of different industrial markets, copying the way the mosses are able to adapt to a broad range of different habitats.

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